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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XL NEW YORK—THURSDAY, MARCH 27, 1919—CHICAGO NO. 13

New Models at Lyons Fair

Citroen, Fiat and Delage Have Post-War Types Ready—Fiat Four-Cylinder 2.5 by 4.3 Gives 34 M.P.H.—Citroen Four, 2.5 by 3.9 Four-Cylinder, for $1470

Electric Equipment, Detachable Cylinder Heads, Unit Engine and Gearbox Are Features—Both Production Models

By W. F. Bradley

LYONS, FRANCE, March 10—Some idea of the several post-war models to be shown at the Lyons Fair has been obtained by a recent visit to French and Italian factories, and while the majority of the French and Italian makers have not post-war models ready, the work of Fiat and Citroen is indicative of what may be expected. The new Fiat, with 105 in. wheelbase, has a touring equipment weight of 1800 lb. The four-cylinder engine is designed to give 23 hp. at 2800 r.p.m.

Andre Citroen has created nothing short of a sensation in Paris manufacturing circles by his determination to produce 100 cars per day. He is one of the first to have produced a car with left-hand control and the gearbox controls mounted in the center.

The size of the small Fiat and of the Citroen is very nearly the same. Both use a four-cylinder engine of the L-head block type. The Fiat has cylinders 2.5 by 4.3 and Citroen cylinders are 2.5 by 3.9. The Fiat uses a 50-in. thread.

Editor's Note—W. F. Bradley, European correspondent for AUTOMOTIVE INDUSTRIES, *has in the last three months visited most of the French automobile factories. Previous to the opening of the Lyons Trade Fair he obtained engineering details and photographs of the new Fiat, the new Citroen and the post-war Delage. Mr. Bradley's cable message from Lyons on the opening of the fair appeared in* AUTOMOTIVE INDUSTRIES *March 6, page 509.*

Fuel consumption has been looked after in both of these models. The Citroen has a fuel consumption of 31 miles to the American gallon, traveling at 40 m.p.h.

Four Fiat Models

Four models are comprised in the Fiat post-war program. These cars, which are all new design, comprise a light four, a medium four, a good-quality six, and an ultra-select six. The first model to be offered to the public is the light-weight four, officially known as Model 501, which was uncovered at the trade fair here.

It is evident that Fiat has profited much by war experience, for, while continuing to remain in the high-class field, changes in design have been made in order to simplify construction, to reduce upkeep and to get weight down as low as possible.

Weighs 1800 Pounds

Model 501 is a four-seater with a four-cylinder engine, 65 by 110 mm. (2.5 by 4.3 in.) bore and stroke, the reduced track of 50 in., wheelbase of 105 in., and total weight with full touring equipment of 1800 lb. The car is offered complete with electric lighting and starting, detachable steel spoke wheels of 700 by 90 mm., speedometer drive off gearbox, tools, and all accessories.

A speed of 44 miles per hour is claimed for this car with full touring equipment. This is not exaggerated,

tests showing that the average car can beat this figure. The engine revolves up to 2800 r.p.m., at which speed the power developed is 23. The power curve, however, shows that at 1400 r.p.m. the engine develops more than 15 hp., and that the maximum torque is obtained at 1000 r.p.m. With a final gear ratio of 1:4.8, the car is an excellent performer at moderate engine speeds and has a very lively pick-up. Standard bodies are built in the Fiat shops, but provision is made for custom bodies when desired.

The engine is a unit construction with clutch and gearbox, this unit being secured by three-point suspension: to the side frame members and to the forward transverse frame member. Cylinders are L-head type, moderately offset, with waterjacket extending to the base of the casting, and are mounted on an aluminum base chamber divided horizontally. The lower portion of the base chamber acts as an oil reservoir. The second housing bolted to the engine contains the clutch, the gearset and the universal.

Detachable cylinder heads make their appearance for the first time on a Fiat. Experiments, however, extend back nearly 3 years, and it was only after exhaustive comparative tests that the engineers decided the balance of advantages lay with the detachable rather than with the fixed head.

The forward transverse shaft driving magneto at one end and water pump at the other is an old Fiat feature which has been maintained.

The adoption of chain drive for the camshaft and the electric generator is new, however. There is a single chain for these three shafts, adjustment being made by rotation of the electric generator, the shaft of which is set eccentrically.

Three-Bearing Crankshaft

Although such a small and compact engine, the crankshaft, which has a diameter of 1.4 in., is carried in three plain bearings. Connecting rods are I-section, machined all over, and pistons are cast iron, with three compression rings and a bevelled oil return groove. The skirts of the pistons are drilled considerably. The wrist pin is hollow and is locked in the connecting rod, the piston being equipped with bronze bushes.

Lubrication is under pressure through a hollow crankshaft to the main bearings, the connecting rod bearings and to the camshaft bearings. Formerly the oil pump was on the end of the camshaft; now it is in the base of the engine, but driven off the camshaft. In addition to a fine gauze filter the whole length of the base chamber, there is a filter around the pump. There is a dashboard pressure indicator, as well as a float in the center of the base chamber, with dial on the side of the engine.

Electric Equipment Mounting

An interesting feature of the engine is the neat manner in which the electric generator and the starting motor are mounted. Both of these are of cylindrical section mounted in cylindrical extensions of the crankcase casting. The generator is on the upper portion of the engine base chamber, just below the water pump. The bolt which passes through the split portion of the housing serves not only to hold the generator in position, but also acts as chain adjuster. The thread on this bolt meshes with a worm cut on the circumference of the generator, and serves to rotate the latter, thus tightening or slackening the driving chain, as the case may be. When the correct tension has been obtained, the whole is locked in position by a nut on the bolt.

The electric starting motor is carried in a similar manner on the lower portion of the engine base chamber.

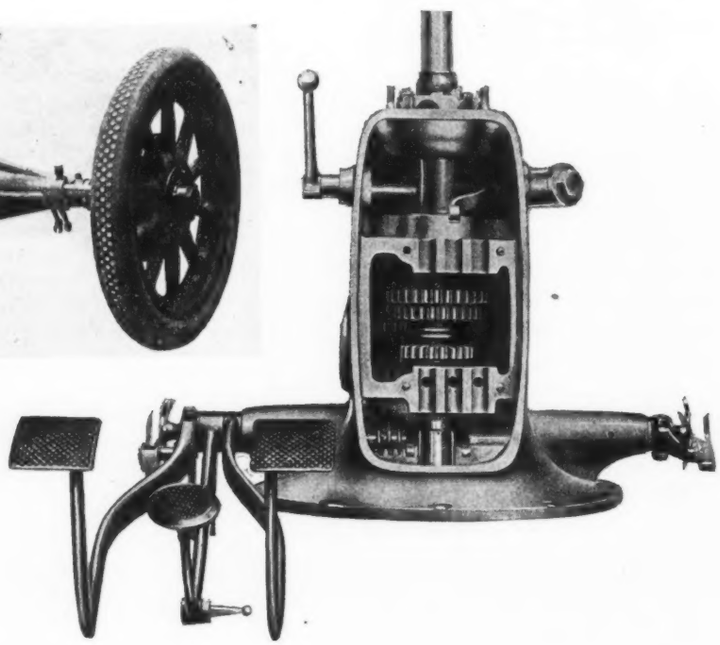
Unit Powerplant Design

The second portion of the unit is an aluminum casting which contains the clutch, the gears and the universal, and has all the pedals mounted on it. An interesting feature of this housing is that it is divided into three distinct compartments. The forward compartment, which is 13 in. overall length, contains the clutch and the clutch withdrawal mechanism.

In the center is the gearbox proper, which is 6 in. long and 5½ in. wide.

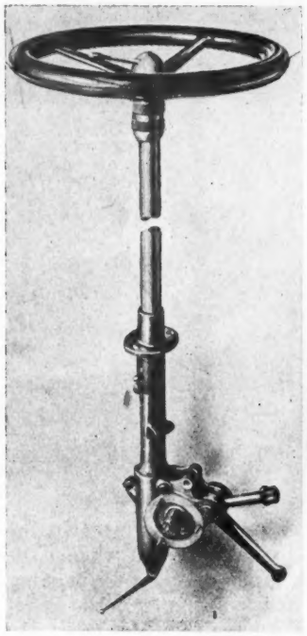
The rear compartment receives the universal joint and the selector lever for the change speed mechanism. A lid, held down by two nuts, uncovers the entire box. But inside this there is a second lid over the gearbox only, this lid holding in position the three selector rods. On the side of this casting there is a filler by means of which oil is fed to the universal.

For a number of years the Fiat rear axle design has

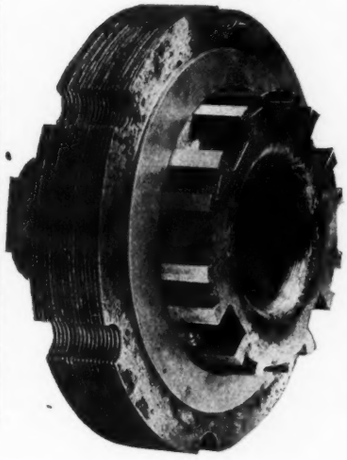


Above—Simple but rugged construction of the rear axle housing and brakes of the new Fiat

Right—Gearset and universal joint housings on the new Fiat, showing also the method of attachment of the clutch, brake and accelerator pedals. Note filler on the gearbox



Left — Fiat steering column with carbureter controlled by an outer revolving sleeve
Lower—Type of disk clutch used on the new Fiat
Right—Combined gearset, clutch and housing



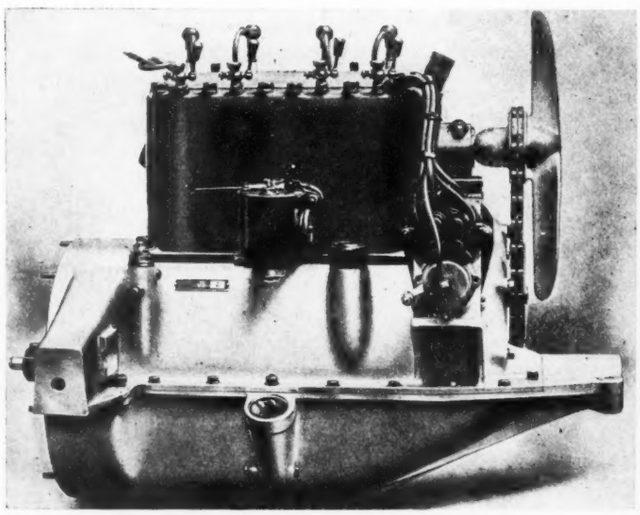
been a couple of steel stampings bolted together in a horizontal plane. These two stampings are retained, but instead of being bolted they are welded together, and a big cover plate is fitted on the rear of the differential housing. This type of axle is very light and possesses considerable strength. Formerly it had the disadvantage of calling for considerable labor in dismounting. Now it is only necessary to disconnect the universal and pull the differential shafts out of engagement in order to withdraw the entire differential, crown wheel and pinion and propeller shaft. The differential shafts carry the load as well as transmit the drive. As the propeller shaft is of considerable length, there is a white metal bearing at the center of its length, merely to steady it and prevent whip when taking up the drive.

Brakes are side by side on ribbed rear wheel drums, the diameter of the drums being 11½ in. and the width 3.1 in. Brake liners are cast iron on aluminum.

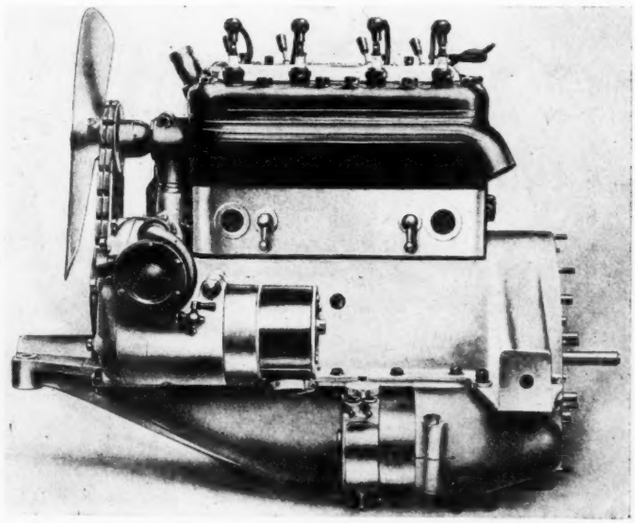
Final drive is by means of spiral bevel cut on Gleason machines. Fiat has been making use of this for about 3 years on all staff cars supplied to the Allied armies, and has decided on its adoption for all touring models.

Changes have been made in the attachment of the propeller shaft housing. Formerly this terminated in a heavy fork, which was connected up to a heavy cross-frame member. The end of this housing now terminates in a sphere, which is bolted up to the end of the gearbox. The drive and the torque are taken through this organ, the springs, which are underslung semi-elliptics, having no other duties than to take care of the suspension of the car. Rear springs are 2 in. in width and are fitted with a reversed leaf above the main leaf, this acting as a damper to prevent rebound.

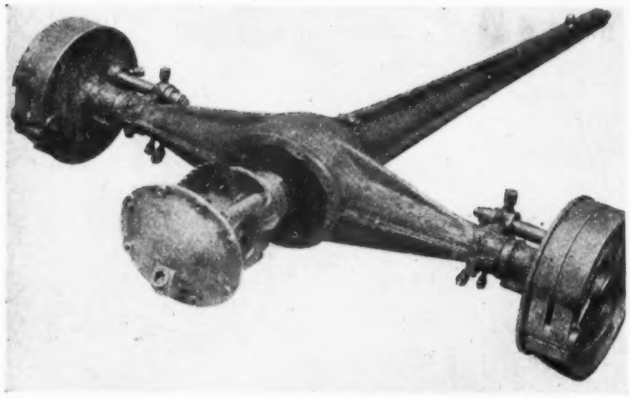
Steering is worm-and-wheel type, and not worm and sector, and is mounted on the forward face of the right-hand crankcase hanger. A ball thrust bearing is fitted on the steering column. Ignition is controlled by a lever on the top of the steering column, and minimum carbureter setting is carried out by turning the sleeve on the steering column.

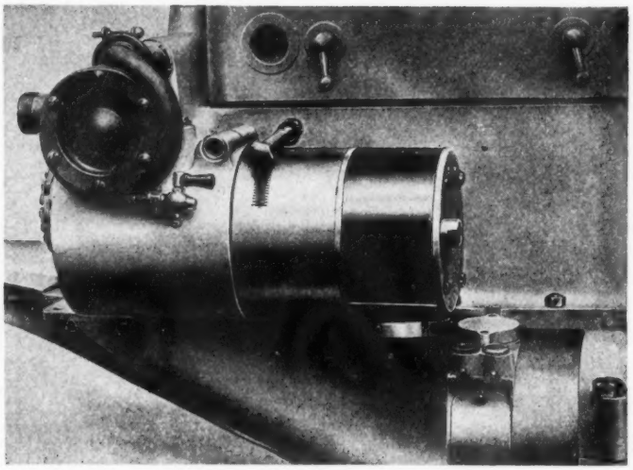


Carbureter side of new Fiat engine. Cylinder head is detachable



Exhaust side, showing neat arrangement of starting-lighting equipment





Above—New rear axle construction of the Fiat light car, showing Gleason gears
Right—Fiat generator, showing method of adjustment

The gas tank is carried through the dash, one portion of this tank being on the engine side and the other portion on the body side of the dash. Flow is thus by gravity. There is a reserve compartment of about 1.5 gal. inside the main tank, and this can be drawn from by a three-way cock on the engine side of the dash.

Care in Equipment

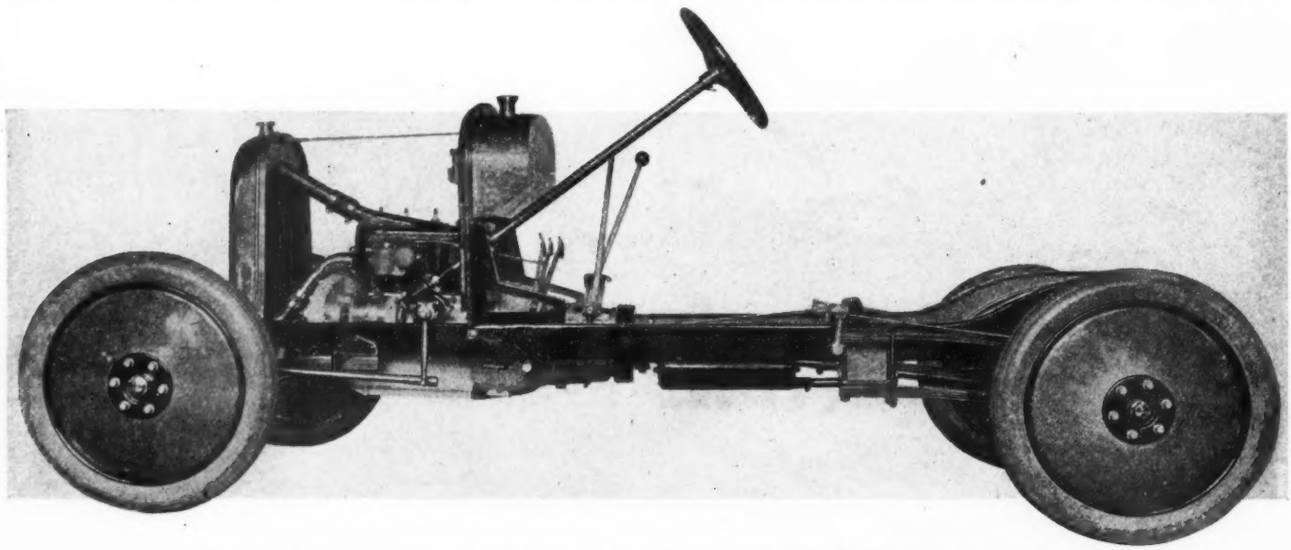
All the electrical equipment of this car is built in the Fiat shops. Although this model is a popular type and ought to be a big seller in all European countries, there has been no skimping on details. As an instance, all the electric wires are carried in metal conduits, all joints are lapped; in every case provision has been made to prevent all oil leakage either by means of washers or more commonly by oil return spirals; the wearing surfaces in the steering gear can be renewed by turning the wheel; the front wheels are carried in an inner double ball bearing and an outer spherical and thrust bearing, while careful provision has been made by means of a special guard to prevent dust entering or oil leaking; provision is made for driving the speedometer from the gearset; wheels are steel, hollow spoke type, with a spare carried in a bracket on the side of the body.

In addition to this light-weight car, other Fiat models to be produced at an early date are a full-sized touring model with four cylinder engine of 75 by 130 mm. (2.9 by 5.1 in.), a high-class six with the same bore and stroke, and a super-de-luxe six of about 85 hp., details of which have not yet been issued.

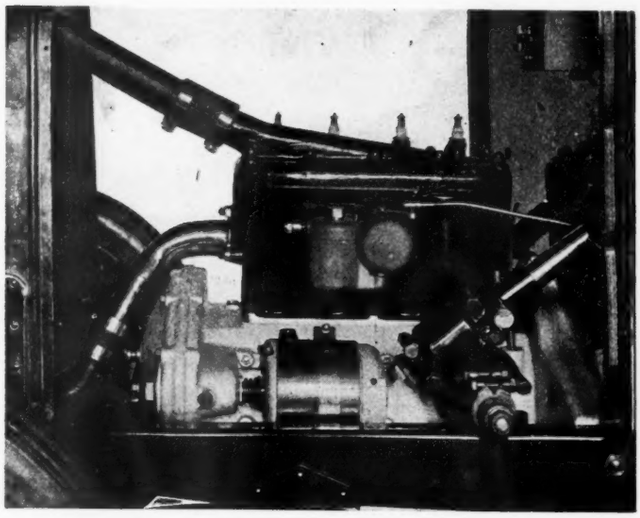
Citroen Four-Cylinder Car

DURING the war the biggest shell-producing factory in France was the establishment owned by André Citroen, in Paris, where 50,000 projectiles were turned out every 24 hours. Before the armistice, Citroen had decided that his post-war activities should comprise the construction of automobiles, bicycles and sewing machines. Within 3 months of the signing of the armistice he had his new car ready, and within 5 months of the cessation of hostilities he will be producing at the rate of 100 complete cars per day.

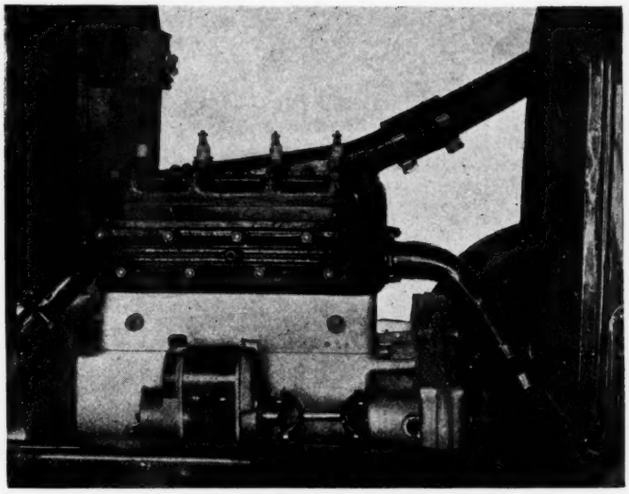
On an average the automobile factories of France, which have not entirely been taken off the work of building cars, will not have their new models out before the month of June or July. Citroen, who never did build a complete car before this year, claims that he will be in full production before the end of April. His figure of



Chassis of the new Citroen light car, which is equipped with Michelin steel disk wheels



Carbureter side of Citroen engine, showing generator and the mounting of the steering gear on the frame



Valve side of the Citroen engine, showing the location, mounting and method of drive of the magneto and attachment of exhaust pipe

100 per day astounds the trade, for no other firm in France, or in Europe, has risen to such an output. Citroen's methods of marketing and advertising are so aggressively American that they have aroused quite a lot of controversy. Admirers see in them wonderful business and organizing ability and critics profess to look askance at a car which needs so much booming. In the meantime Citroen is showing his advance models everywhere, is establishing service depots throughout France, and is continuing to promise deliveries for April.

The Citroen is decidedly a light car, of French design, with a lot of American ideas incorporated into it. The engineer responsible for its production was for a number of years responsible for a French light car which had local success but was not built on a big enough scale to become known far from Paris. When he linked up with Citroen, the engineer had to think in big numbers, with the result that he had to pay a lot more attention to production methods than was ever before thought necessary. Citroen has not yet got into production, but he claims that in a few months his factory will be able to show points to the best in America.

The engine is a four-cylinder one, 65 by 100 mm. (2.5 by 3.9 in.) bore and stroke, and the car is intended for people who will consider operating costs very closely, and with gasoline costing $1.20 per gallon and likely to continue at this price for some time there is no room for big bore engines if the work can be done equally well by a small engine.

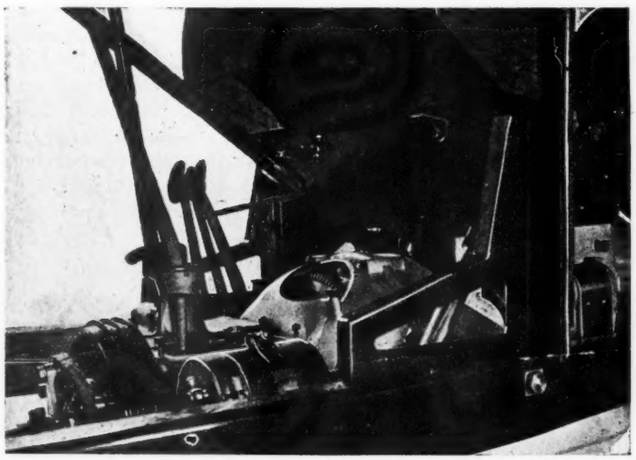
The detachable cylinder head has been adopted partly because of the facility for carbon removal, but more largely on account of ease of production.

Left-hand steering with central control has been decided on entirely on account of simplification in construction and assembly.

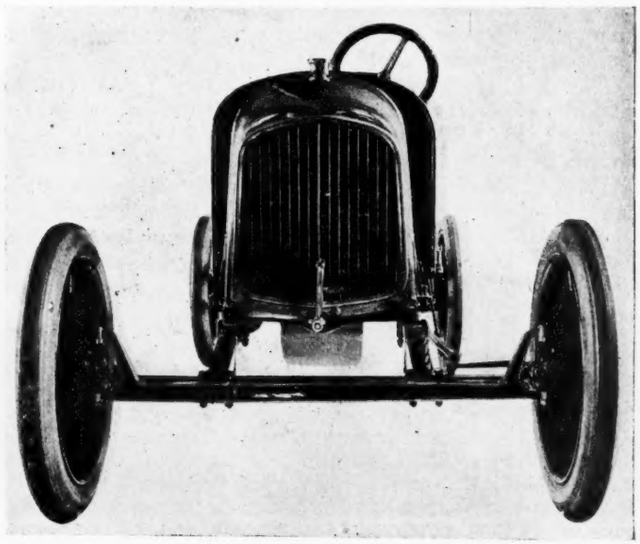
Michelin steel disk wheels have been adopted as standard. These are fitted with tires of 710 by 90, and give a clearance of 8½ in. Wheelbase is 100 or 112 in., with a track of 46 in. A speed of 40 miles an hour is claimed for this car, with a gas consumption at the rate of 31 miles to the American gallon.

This car is being put on the market as a two or four-seater touring type, also two or four-seater closed model. Present price for the fully equipped four-seater is $1,470. It is intended to use the same power plant in a heavier chassis as a taxicab and as a 1000 lb. truck.

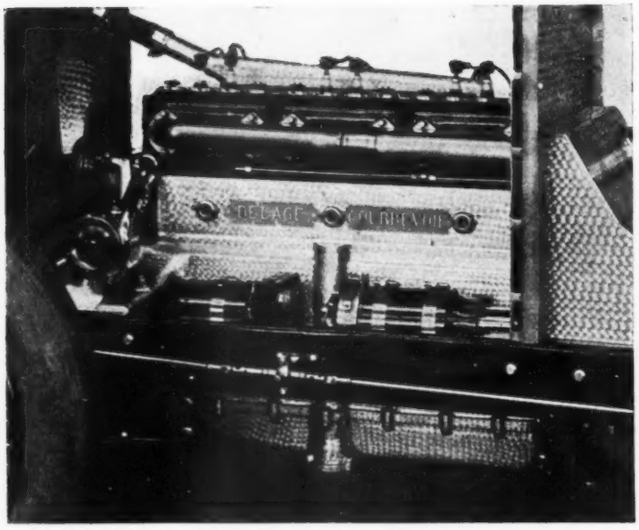
Although the engine, clutch and gearbox form a unit, Citroen has not adopted the American method of cast-



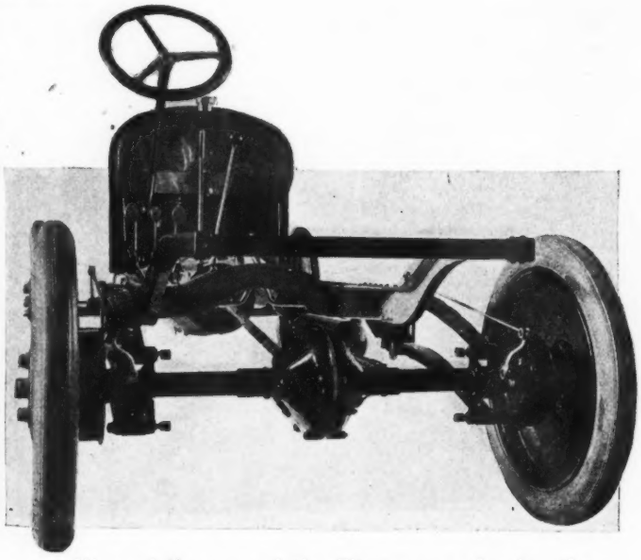
All pedals are attached to the top of the gearbox in the Citroen. The clutch housing has been cut away to show the gear on the flywheel



Front view of the new Citroen light car, showing the spring suspension



Valve side of the Delage engine, showing generator and starting motor



View of the rear of the Citroen car, showing the method of rear spring support

ing cylinder and upper portion of crankcase in one. The cylinder block is mounted on an aluminum base chamber divided horizontally, the lower portion forming an oil pan. The clutch housing and gearbox are separate aluminum castings bolted up to the engine crankcase, the unit thus formed being attached in the frame at three points. In doing this the crankcase bolts to the two side members, and at the front there is a trunnion attachment to the first transverse frame member. Within a very short time engine base, clutch housing and gearbox will all be produced by die casting, the big production contemplated justifying this initial expenditure.

Provision has been made for the withdrawal of the entire power plant without disturbing any portion of the body. After the radiator has been taken off, the forward universal disconnected, and such auxiliaries as gasoline line and exhaust pipe detached, the entire unit can be pulled forward, passing under the dashboard, and lifted free without touching the body.

L-Head Engine Type

There is no great departure from standard practice in the engine. It is of L-head type, with valves on the right-hand side. The crankshaft is carried in two plain bearings, which are lubricated under pressure by means of a pump in the base chamber.

The magneto is placed fore and aft on the valve side, and the electric generator in a similar position on the opposite side. The two, together with the camshaft, are driven by means of helical gears.

Cooling is by thermo-syphon water circulation through a gilled-tube radiator, the inlet pipe being branched from the two sides of the radiator and entering the cylinder jacket on its forward face. There is no fan, although a fan bracket is carried in case it should be necessary to use a fan in tropical countries. The engine is declared to develop 18 hp. at a maximum speed of 2100 r.p.m.

The Solex carbureter fitted has the distinctive feature that by unscrewing one nut the whole device comes to pieces, exposing float, counterweights, jet and tube.

All the electrical apparatus is built in the Citroen factory, and comprises a 6-volt, 10-ampere dynamo; the battery is carried inside the chassis, and the electric starting motor is to the right of and alongside the gearbox.

The clutch is single-plate type, lined with fiber fabric and running dry in a closed housing.

There are three forward speeds and reverse, with oscillating type of change speed lever mounted directly on the gearbox cover.

Hotchkiss drive has been adopted, with a rubber disk coupling at the front and a plunger type universal at the rear. Final drive is by means of Citroen herringbone gears.

Quarter Elliptic Suspension

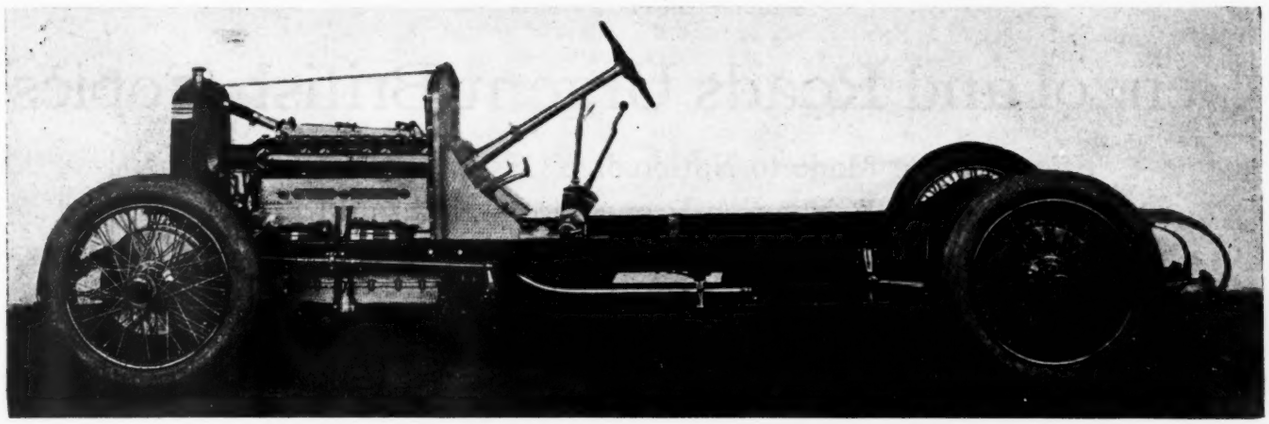
Undoubtedly the most unusual feature of the car is the springing. At the front this consists of quarter elliptic springs bolted under the frame members and attached to the straight axle. At the rear double quarter elliptics are employed, these being attached at their forward end outside the frame members, and at the rear one is mounted above and the other below the axle housing, the attachment being by means of a forged bracket fitted on the axle tubes and heavy and hardened and ground bolts provided with adequate lubrication. This rear suspension forms a parallelogram which assures the axle being kept parallel to the chassis at all times, and, while reducing the unsprung load, gives an ideal construction for transmitting the drive and the torque through the springs.

New Delage Six

DELAGE has stepped out of the light-weight, medium-powered car class into what may be termed the luxury field, by the production of a high-grade, fast, six-cylinder model. Louis Delage has been working toward this class for a number of years, and although he has specialized in cars of medium power his experiments and his extensive racing have been carried out with a view to the production of a really high-class job. The war has given the opportunity desired, and after building several hundreds of his new six for the French army, he is now putting it on the market in a modified form.

Unit Power Plant Design

The engine, a block six of 80 by 150 mm. (3.1 by 5.9 in.) bore and stroke, is rated at 24 hp. but develops 70 hp. at 2000 r.p.m. It forms a unit construction with clutch and gear-



Chassis of the new six-cylinder Delage

box, is carried in a chassis of 135 in. wheelbase, fitted with front and rear wheelbrakes and capable of a speed of 70 miles an hour with touring equipment, and 65 miles an hour with closed body.

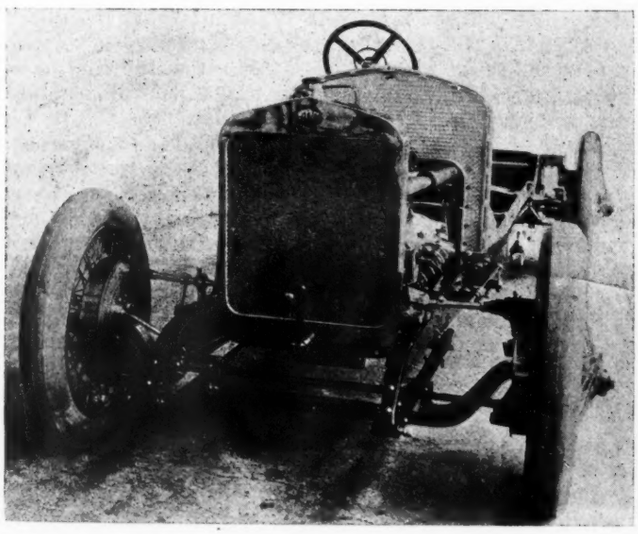
The speed of the six-cylinder Delage with full touring equipment is easily 70 m.p.h. With closed body the car can do 65 m.p.h. Gas consumption is at the rate of 14 miles to the American gallon. During the war it has been necessary to make frequent trips from Paris to Grenoble, a distance of 360 miles. Driving fast, it was found that an average speed of 43 m.p.h. could be made for the entire distance, including all roadside stops, with a gas consumption of 11.2 miles to the gallon. Fixing the maximum speed at 47 m.p.h., this speed never to be exceeded however tempting the road might be, the average worked out at 37 miles an hour, and gas consumption averaged 14 miles to the American gallon. This indicates rapid pick-up and high speed on the hills, for a portion of this road is through a mountainous district.

Delage is building this chassis in three wheelbases, 132, 136 and 145 in., to take respectively a runabout, a touring body, and a big closed body. Track is standard 56 in. for all. Final gear ratios are 3.6, 3.4 and 3.27 to 1. Detachable Rudge-Whitworth wheels are standard.

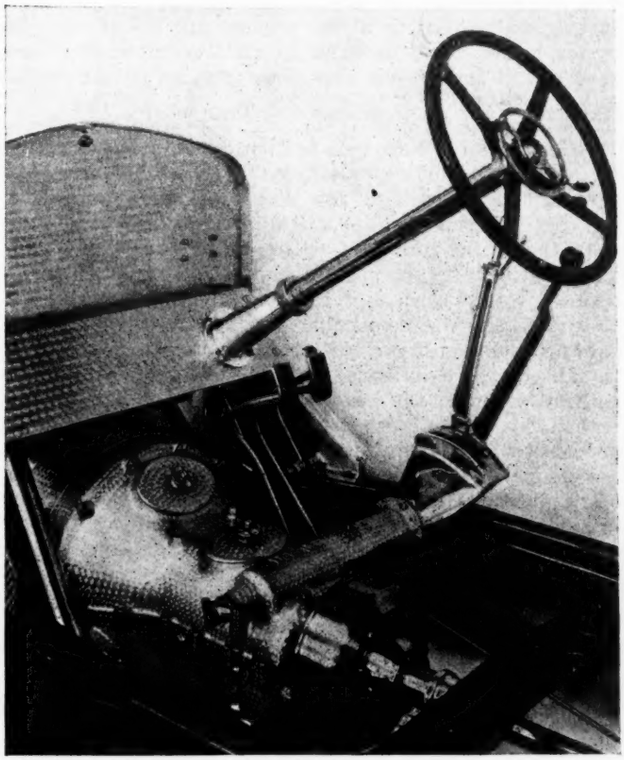
Interchangeable brakes are fitted on all four wheels. The front wheel brakes are built under Perrot license, Perrot being a French engineer who first specialized on front wheel brakes and secured patents on many of their details. He first applied his brakes to the cars built by the now defunct Argyll company. Delage used these brakes for 2 years on his racing cars and was so satisfied with the results that he decided to apply them to his touring models. Front and rear drums are the same size, diameter being 15½ in. and width 2.3 in. The four brakes are operated together by the pedal and at a speed of 60 m.p.h. are capable of bringing the car to a standstill in 100 yd. This means that 60 m.p.h. is a safe speed so long as the driver has an open stretch of 120 yd. ahead of him. There is a hand brake on the gearbox.

The L-head engine type has inclined valve stems, intake manifold cast with the cylinders, and exhaust manifold separate. The layout has been designed to give complete accessibility. Thus the pump and magneto are driven from a transverse shaft; the electric generator and the starting motor are fore and aft on the left side, just below the valve stem chamber; on the right the two Zenith carbureters are bolted up direct to the cylinder casting and are fed by the vacuum system; on the same side, and at the forward end of the engine is the combined breather and crankcase filler, and at the opposite end is a three-way tap which gives level, overflow and emptying of the base chamber. The crankcase webs

(*Continued on page* 709)



The new Delage is equipped with front wheel brakes interchangeable with those on the rear wheels



Clutch housing and gearbox, foot brake and control levers on the new Delage

Benzol and Roads Urgent British Topics

Efforts Being Made to Nationalize Gasoline Substitute As a Home Production Proposition—Notes on Car and Truck Output

Special London Correspondence

LONDON, March 7—Just now the two topics most interesting to the British motor trade and prospecting motorists are the benzol situation and the future of the roads. As regards benzol the interest centers in efforts being made to nationalize it as a fuel of home production and to prevent its handling becoming a monopoly of the oil and gasoline trusts.

I made reference to the matter in a former note, but since then a meeting has been held under the auspices of the new National Benzol Association at which some interesting information was disclosed relative to the development and present position of the British benzol industry.

At the close of the war British gas companies were producing 11,000,000 gallons of benzol a year and the annual output of the coking ovens amounted to 21,000,000 gallons—a total of 32,000,000 out of the estimated total of 200,000,000 of motor spirit annually required by Great Britain.

Gas companies, by a slight diminution of the calorific value of gas, it was urged, would increase their annual production of benzol to about 40,000,000 gallons if the authorities permitted, inasmuch as its deprivation only affects the quality of gas to the extent of 5 per cent. It was stated that in a few weeks some twenty London motor buses would be running on a mixture of 25 per cent benzol and 75 per cent duty free industrial alcohol.

National Control of Industrial Transport

As regards the future of British roads, interest centers in the government's new scheme under a bill now before the legislature entitled the Ways and Communications bill for nationalizing practically everything connected with industrial transport within the country, including also the electricity supply in bulk. Many motorists are opposed to the control of the roads being vested in this body; this opposition being accentuated probably because of the almost certainty that the railways will be nationalized, and it is feared that a single body with an ex-railway officer at the head, and vested with powers over transit by rail, roads and internal waterways, will be dominated by railway interests.

Personally, I do not share these fears, because the bulk of people recognize that the interests concerned are not intrinsically antagonistic, but complementary one to the other, and, also, as far as motor transport of roads is concerned, because the government is committed to a national electricity scheme which when developed will involve a wholesale electrification of rural districts and almost certainly, too, will lead to a wide use of electricity about farms for lighting, traction of implements over the land and of produce to the markets, or at least to the nearest convenient railhead.

Ideas embodying this form of development find more favor now than former schemes for light or roadside railways after the Belgian model. Our experience with this class of construction is that it is expensive relative to its capacity and benefits, and of course any rail service must be circumscribed and limited as compared with road transport.

Generally speaking, the chief drawback to British internal betterment has been too much parochialism. For instance, we have 2100 separate roads and highways authorities in the country, and the proposed measure referred to is intended to sweep the lot into a single control with departmental administrators.

London Motor Buses

The Associated Equipment Co., Ltd., of Walthamstow, London, is the largest producer of gasoline truck-chassis in the country, and is now listing its products to the public. At present it is building a 6000-7000 lb. truck-chassis which is largely a development of the famous B type chassis of the London General Omnibus Co., whose headquarters are at Walthamstow. The A. E. C., the short title of the chassis company, is about to introduce a 4000-5000 lb. chassis, which will place the company in a very favorable position to compete on the truck market at home and in the British Colonies.

As builders of the L. G. O. bus-chassis this company will shortly be introducing a new model which, it is expected, will be about 1500 lb. lighter than the present bus chassis. This weight reduction is largely the outcome of the action of the local street traffic authorities in insisting that the fare must be reduced. It happens fortuitously that this change is being made at a period when it is necessary to replace the L. G. O stock of buses, which had become depleted from 2742 before the war to under 2000, its present number.

During the war 230 of the 1093 buses sold to the government have been replaced. It is stated that it will cost over $13,875,000 to replace the entire number to the pre-war standard of 2742 vehicles, this estimate being based on an allowance of not less than $2,000 per vehicle above the pre-war price.

The A. E. C. output resources are up to 140 vehicles per week, but probably this number will be increased when the factory has been completely modernized, or, to be more correct, Americanized by the Works Director, Samuel Wallace, who came to us from the General Electric in America.

The Dunlop Rubber Co.

The Dunlop Rubber Co. is probably the only British tire making company which owns its own tire fabric making plant. For years Rochdale in Lancashire and in particular the mills of John Bright & Co. have supplied tire fabrics, but some time back the Dunlop interests decided to be their own exclusive providers of fabrics.

They are spending about $7,500,000 on a new mill for weaving the tire fabric. It will employ some 3000 workers.

A Birmingham paper states that the local Wolseley works are in a position to produce 20,000 cars yearly

as a result of war-time developments in the factory buildings and plant. Almost 2000 vehicles a year was the reputed pre-war capacity of this factory, which shared with Daimler at Coventry the credit of having the largest organized potential output capacity among British factories. At present reputed prices it may be doubted if there will be anything like so large a demand for Wolseley and other high-priced models, as at present listed, but the Wolseley interests are associated with the production of a neat light car—the Stellite, which is fairly popular and if concentrated upon could readily find purchasers at the comparatively high prices asked for vehicles of its class. I have not found many persons hopeful of there being any large market here for average British cars at present reputed prices. The fact is the cost of living and taxation won't leave much for motor car buying at present prices.

It is rumored that Wolseley will shortly be declaring for a world trade on a quantity production basis. My informant states that it is likely that three sizes of cars will be listed, to suit the three chief categories of buyers and class of body most in demand. Of these the medium grade car is likely to be the chief attraction, provided that the price of materials and labor charges do not advance. The Wolseley factories now cover about 100 acres, and having regard to the company's already notable decision to concentrate on cars to the exclusion of trucks, which before the war were a joint line in the much smaller factory than has now to be filled, it seems obvious that will only be possible to meet the situation with a car which shall eclipse all competition by combining value and price on a scale hitherto not attempted in Great Britain. What that price will be can only be conjectured now, but it must not exceed $1,750 to permit of the British colonial trade being recovered. Moreover, it will be necessary to set aside a much larger capital in spare parts which must be stocked where most convenient for distribution in the territories concerned. The war has taught our makers lessons on this score, chiefly because of the Aircraft authorities insisting on a fixed percentage of spares—practically so many complete engines—per batch of engines ordered. The alternative course to cheapen manufacture here, of course, will be to manufacture of the larger colonies, after the model of Fords, but this, of course, demands putting down capital in assembly buildings and plant. The new 1919 Buick Six has just arrived at the London premises of General Motors. It was imported under license of the Board of Trade and is one of the first American models to arrive. At the price it is hoped to be able to list it, even allowing $500 for the cheapest body to be fitted her, and allowing also 33 per cent ad valorem for import duty, I doubt if any British four, let alone a six, in the corresponding category, will be found to approach this new Buick for real value.

It is reported that two of our oldest British motor companies are joining interests. The companies concerned are White & Poppe, Ltd., engine specialists, Coventry, and the Dennis Co., Guilford, makers of trucks. Dennis came in from the cycle trade twenty years ago, passing through the stage of motorcycle making to car and truck making, but more recently have concentrated exclusively on trucks. They were pioneers as users of the worm-axle drive for trucks at a time when only the Lanchester-Hindley hour-glass form of worm was being used for cars, and have consistently used the worm-axle and also the engines of the White & Poppe Co.

While this fusion is quite in order so far as it concerns these two companies always associated in the way stated, another issue is raised by this sort of combination. When the Bosch interests here were taken over by a subsidiary company, one of the Vickers group, some people in the trade looked askance at it on the score that now the Vickers Co., as owners of the Wolseley car business, were going to enter into competition with their own likely customers for magnetos, etc.

Timken Solving Difficult Production Problem

Daily Production Conference and Use of Simple Chart Keep Manufacture Up to Schedule

By J. Edward Schipper

PART I

TIMKEN axle production presents a problem in manufacture which differs materially from that ordinarily encountered in an automobile factory or in any plant where but two or three models, at most, are produced.

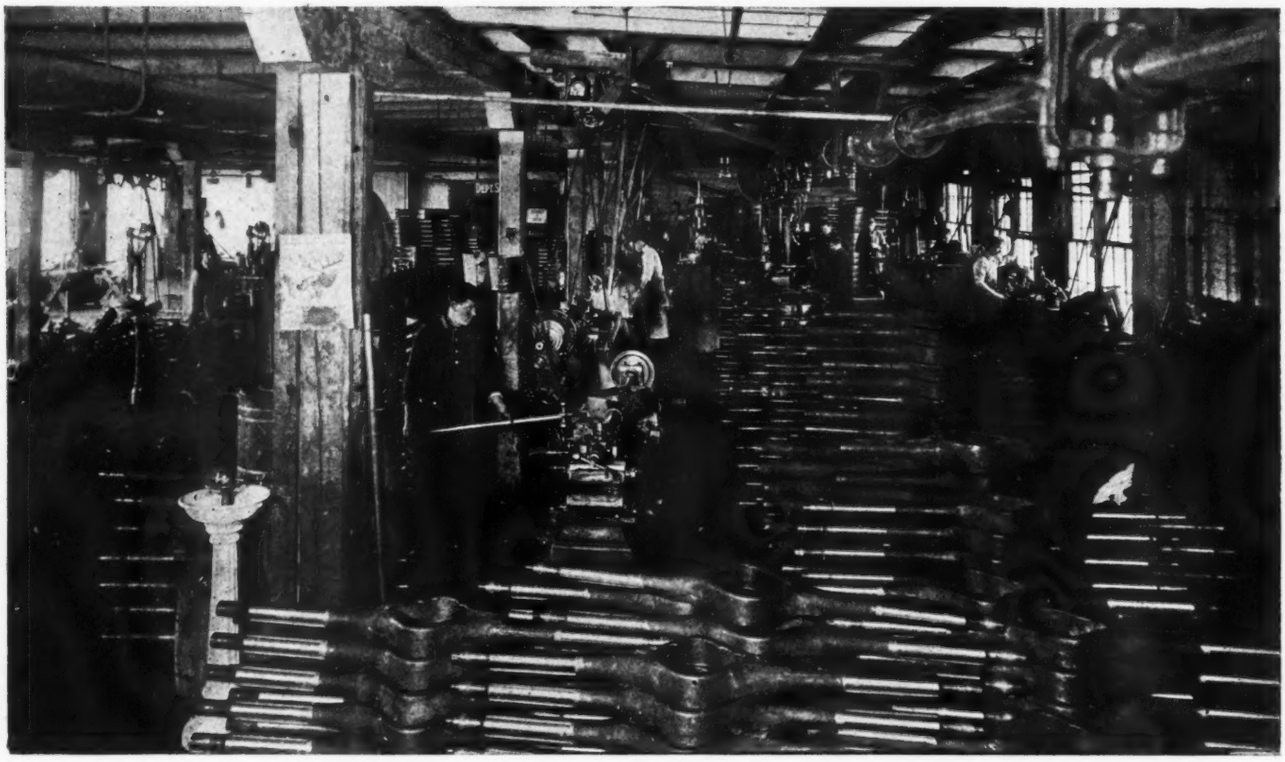
The Timken-Detroit Axle Co. builds a great many varieties of axle, and since the number of each variety is apt to change suddenly, being greatly decreased or increased in accordance with the desires of the manufacturer of the finished car or truck, it has been necessary to lay out the plant so that the greatest amount of elasticity prevails as regards the handling of the axles in such a way that the production stream is constant, whether the number of one model drops off or increases in production.

To meet this situation, the progressive methods, such as would be provided by a traveling chain or some other arrangement of a similar nature, would not be possible because the forms of the carriers to handle the different parts would have to be changed to take care of the different models coming through.

Since it is not possible at any time to calculate for a long time ahead the number of a particular model coming through, this phase must be eliminated, and a method has been designed to overcome difficulties of this nature. Timken axle manufacture is strictly a group or departmental proposition.

All axles have similar parts. They all have housings, carriers, tubes, shafts, and in the case of front axles, they have knuckles, etc.

Based on this idea the Timken factory is divided into departments to coincide with the common parts possessed by axles. There are a housing department, a carrier department,

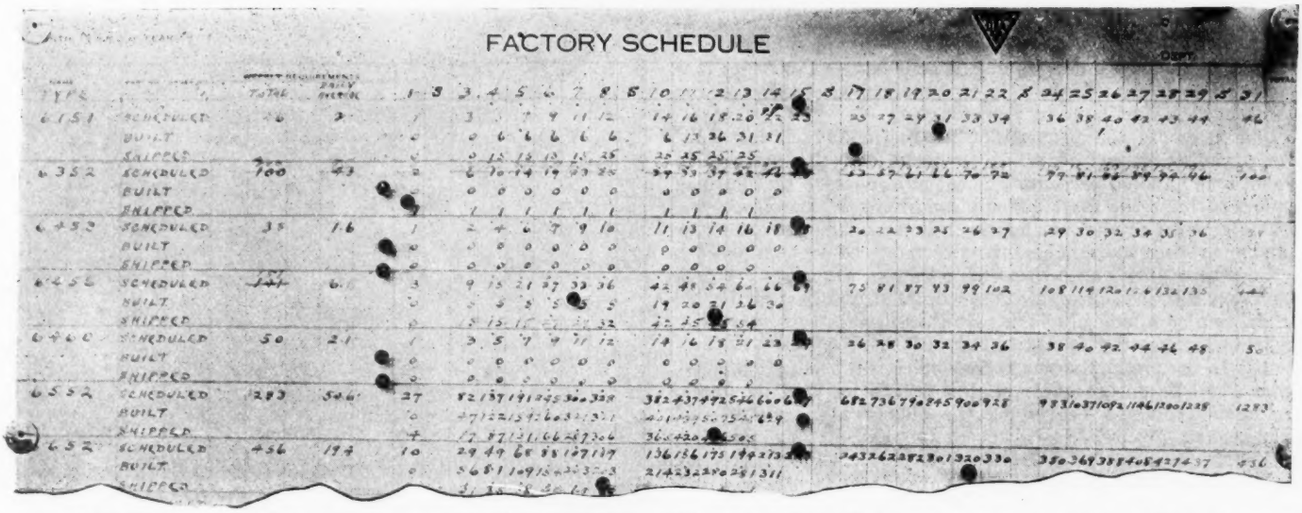


A good example of the segregation of departments. This is the axle housing department and, as will be noted, work on all types of housings is passed through here

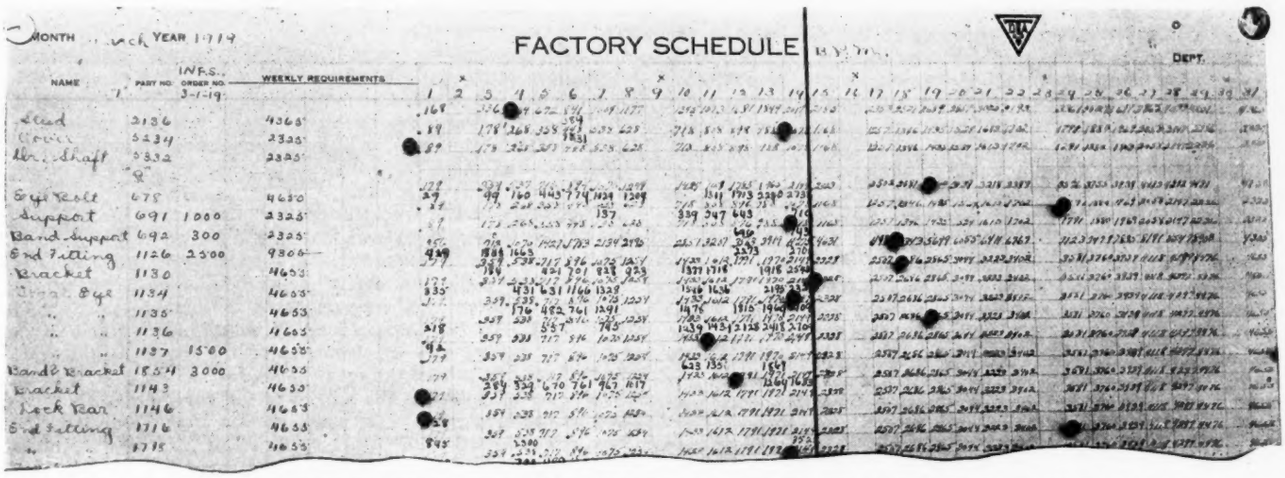
and other departments grouped similarly for rear axle manufacture, and for the front axle manufacture there is a knuckle department and other departments for front axle parts.

Distributed all through the factory, which comprises a large number of buildings, varying in size, are these departments, each specializing on one particular part of several models of axles. There may be going through each department a varying number of each axle every day. If there are twenty-five different model axles being produced in this particular plant, then through each department there will be twenty-five different styles of parts unless the parts happen to be identical for different models of axle, as sometimes occurs.

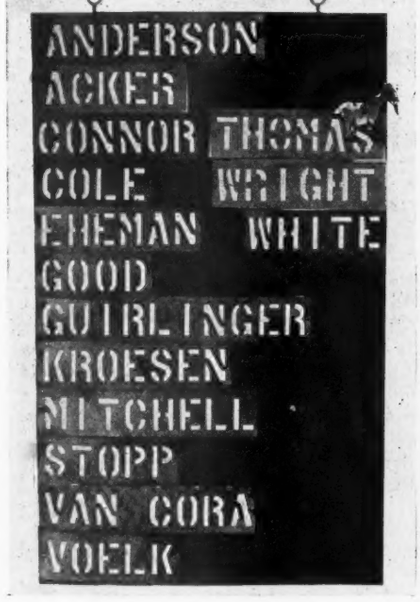
Forgings for all types of axles are handled in the same forging shop. This view gives an idea of some of the many types of forgings handled in this shop. A number of the various front axle forgings are shown in the foreground



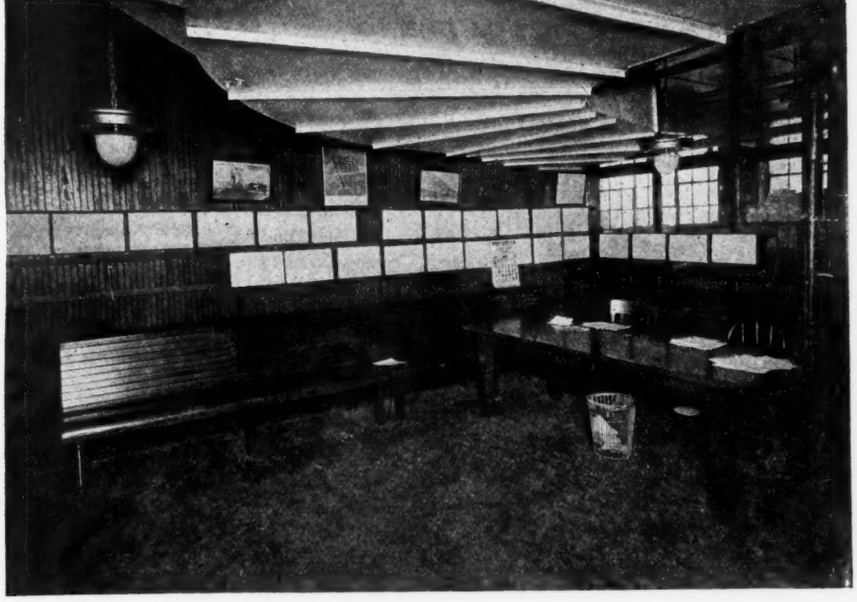
Factory schedule pinned on wall of production manager's office. The solid vertical row of pins under date of March 15 shows the present date. These pins are moved along one column every day. The other pins indicate the dates corresponding to the number shipped or built



This chart shows the department schedule. A rubber band slipped around the card indicates the date (March 15), and all pins to the left of this line indicate jobs behind schedule; all pins to the right indicate jobs ahead of schedule



The foreman whose department has held back production is voted the "goat"



Conference room in which the production conference is held. The foremen of all departments gather here daily and the factory schedules are gone over

It is evident that in order to keep up with production a department will have to run ahead and store some of its production in finished stock, or else it will have to vary its machine set-ups quite frequently in order to take care of the different jobs that have to go through.

This presents the problem of production which the Timken planning department has to meet, and the manner in which it is handled presents a great object lesson of efficiency under, perhaps the most difficult conditions of manufacture.

The general production manager is supplied with an order number stating the number of axles required on that job for as long time ahead as it is possible to give the order. Working from this information, the production manager plans his production on a monthly basis. He then divides this on a daily basis and makes that quantity the daily quota of each department. In the production manager's office is a production chart upon which is entered the number of the job and its name, and under columns headed by the date are the number of axles to be produced each day. In this factory schedule under the current date there is placed a vertical row of black-headed pins, and under the daily dates is placed a pin on the date corresponding to the number of axles produced and another showing those shipped.

Explanation of Production Chart

The explanation is:

If a certain job is going through at the rate of 100 per day and 100 axles should be finished on the first of the month, 200 on the second, 300 on the third, 400 on the fourth, etc., and the date of the month is the tenth and only 500 axles have been produced and 400 shipped, the vertical row of black pins would be under the tenth, indicating that it is the tenth of the month. The red pin would be under the fifth, indicating that production only up to that day's schedule had been completed, and a yellow pin under the fourth showing that shipments were only up to those scheduled for the fourth.

A glance at the chart would show that on this particular job the production is 5 days behind. On the other hand, if by the tenth 1500 axles had been produced, the red pin would be in advance of the black line under the fifteenth; so that production is 5 days ahead, or if there is enough of that axle in finished stock to complete the month's order, the pin might be out to the end of the month, showing that the order was complete on that axle for the month.

Thus the chart tells the production manager at once just what jobs are lagging behind schedule, which are even with schedule, and which are ahead.

The same scheme is followed in the departments. Each has its chart with a black line formed by a row of black pins, or a rubber band slipped around the chart at the current date. Each has the orders listed upon the chart and pins showing the date corresponding to the amount produced indicated by red pins. All red pins to the left of the vertical black line indicate jobs that are behind; all those to the right indicate jobs that are ahead and tell the foreman of that department immediately what jobs to push and what jobs upon which he has a safe margin. These production charts telling the status of the complete axles in the production manager's office and of the different parts in the foreman's office of each department handling that part furnish the key to the entire production situation in the factory.

Hold Daily Production Conferences

Every day a production conference is held. After the day's work is complete each foreman takes his chart to the conference room, where it is hung upon a hook designated for it, as shown in the illustrations. As these boards are hung in place they form a row around the conference room which indicates the condition of any job at a glance. The foremen go over the charts, one by one, and thus readily see what condition of affairs exists in other departments, and they then get an estimate on the entire situation and know what to concentrate upon.

If a job is exceptionally late the foremen of the departments in which the pins for that job are lagging are called upon to explain why they are not up to schedule. If it is because material is not at hand the follow-up department is called in to explain why they have not secured the material.

Before the parts get into the finished part stockroom they are given a careful inspection, so that all parts drawn from the finished stockroom are ready for manufacture and have been certified by the inspection department

If the follow-up department shows that the material has not as yet been purchased, it is up to the purchasing department. If, on the other hand, the material is in the factory but is lying idle for want of machines, the production managers take machines from a job which is in advance, as indicated by the chart, and place them upon this order, in order to hurry it up and bring it into line.

A bonus system is worked out so that lateness on the part of a department may cause a cut in the bonus, and it is quite certain that the foremen who are well up in advance are going to hurry the foremen who lag behind on a particular job, thus threatening the payment of the bonus, or reducing its amount. In fact, at the end of every month an election is held by ballot, and the foreman of the department which has delayed the others the most is elected as the goat, and on a board which contains the names of the foremen of each department a goat is pinned opposite his name and remains there for a month. Needless to say, the goat is careful to remove the symbolic animal from his name on the succeeding month.

This gives the follow-up phase at the Timken plant. There is another phase, however, which is of equal importance and which will be discussed in Part II.

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Book Review

AERONAUTICS MADE EASY, by Capt. W. A. Aston. Published by Iliffe & Sons, Ltd., 20 Tudor St., London, E. C. 4, England. Price, 4/6d.

The remarkable progress which has been made in aeronautics during the war has brought the airplane almost to the commonplace level of the motor car, but owing to the secrecy with which it was necessary to veil this development during the war, general knowledge of aeronautics has not kept up with the progress of actual practice.

Students of aviation, and all who take an intelligent interest in flying and flying machines, will therefore welcome the new text-book on the subject, which has been prepared by Captain Aston. The author deals with a fascinating subject in a very interesting manner. His object has been to show how an aeroplane flies, rather than why it flies, and he accomplishes this by first explaining how the underlying principles of flight are applied, and then giving the details of the airplane itself, and showing what functions each part is called upon to perform.

Among the subjects dealt with are the influence of streamline formation on speeds, the shape and angles of planes and other surfaces, the stability, the functions of the propeller, loading and control, air-cooling and water-cooling, etc., The advantages and disadvantages of pusher and tractor models are set out, and the capabilities of the various types compared.

Industrial Development Depends Upon Partnership of Capital, Management and Labor

By Harry Tipper

AT a meeting of industrial engineers, which occurred in this city 2 days ago, a great deal of the time of this convention was spent in the study of the labor question and the human side of industry. This is as it should be, and it is an encouraging sign when engineers turn from the examination of machine production, motion study, and other items of a like mechanical character, to the study of the most important factor in production, the human being, and to the complex forces which are behind the difficulties observed in present production.

Of the papers which were presented, the paper by C. E. Knoeppel, of C. E. Knoeppel & Sons, New York, contains so much which is of value to the study of present conditions and the means that ought to be taken in order to overcome the difficulty, that we are quoting liberally from this paper, the whole of the paper occupying too much space to give it in full.

War Due to Workings of Progress

"Was this all an accident? Was the ambition of one man, or one class, or one nation to blame for this world catastrophe? Yes, but only indirectly. As I review the past, it seems to me that the world war was the result of the workings of a law of progress, which has been in evidence since the beginning of time, a law to the effect that while progress is ever upward, it is never in the form of a straight line, but a series of curves or cycles, made up of four steps:

"1. Conflict. 3. Refinement.
2. Development. 4. Retrogression."

"In life we find a conformity to the law above mentioned. Study the child, his relation to his parents and his teachers, his combative and sometimes savage nature, his days of the gang period, his recklessness and tempestuousness in his first years of school life, and you will find an excellent illustration of the conflict period in human progress. The youth becomes serious. He studies, goes through college, and begins his career in business. This is his development period. Then follows the period of refinement, in which the man builds well on the training he receives, becomes successful in his work, perhaps amasses a fortune. Finally at the height of his power, he begins to wear out, his energies begin to fail, and he is in the retrogression period, from which none of us can escape."

"What is the world situation to-day? People tired and weary after years of fighting; depleted treasuries; enormous debts requiring years, generations perhaps, to pay off; a world hungry for the food necessities of life; the most gigantic destruction of property the world has even seen, making rebuilding a task which staggers the imagination; millions of crippled, blind and helpless who must be taken care of in some manner; other millions who were directly or indirectly engaged in warfare, suddenly without occupations or immediate means of earning a livelihood.

"To fill depleted treasuries, feed the hungry, pay heavy taxes, replace and rebuild destroyed and damaged property, and care for the sick and helpless, money in huge quantities is going to be needed, and money can only come through trade at home and abroad. The nation that can win the most trade will be the most prosperous. The one that is the most efficient will win the most trade. This applies to nations, to industries and to plants in the same industry."

Something Certainly is Wrong

These paragraphs indicate Mr. Knoeppel's basis for argument, and while there might be some controversy as to his statement that these things are economic in their character, nevertheless, the conditions which he describes are here, and his examination of the subject is informing and suggestive.

Much more suggestive, however, in connection with the present condition, is the statement in respect of industry and the fact that there is something wrong with our industrial system from an observation of its present results, not only in connection with the warfare and dissatisfaction between the different departments of industry, but in connection with the final result of this whole industrial development which are stated in his paragraphs:

"Something is certainly wrong, when prices should be on the continual advance, in an age of the most improved machinery, the most advanced shop practice, the best that can be devised in the way of management methods, and the latest in industrial devices. Something is wrong with conditions which makes the dollar less in value to-day than a year ago an dmuch less to-day than it was five years ago.

"Trace if you will the transition from basic raw materials to the product in the hands of the consumer. A raise in wages at the start increases total cost, on which profit is figured, so that the concern which purchases the product, *as material,* pays both for the raise in wages and the profits on the raise as well. The concern that buys this material is forced to raise wages, we will say, and the next man who buys this product, as material, not only pays for the extra cost, a slabor and profit, of the first step in the progress, but the second as well, it does not require much imgaination to realize that by the time the ultimate consumer gets the finished product, it is loaded up with a series of consistent raises in wages and additional profits.

The User Pays the Bills

"The user pays the bill. Who is the user? Worker, manager and capitalist. Which is the largest class? The working class. Consequently, while the worker receives more money in wage increases, he is no better off; in fact, worse off, because prices increase in greater proportion than his wages increase, due to the successive stages through which the work goes from raw material to finished product, and the addition of profit to total cost, the cost including wage increases. The load, therefore, falls on the shoulders of the ones who, while causing the conditions to a great extent, are the least able to bear it. Does labor realize this? It does not."

There is an interesting point for manufacturers to consider in connection with their responsibility for the

outlook of the worker, a responsibility which has been considered very rarely in our industrial work, and a responsibility which can only be discharged by measures of education that have not been considered up to the present.

"I was recently discussing the business situation with a Pittsburg manufacturer. He was protesting most strenuously because his labor was producing less and costing more than ever before, and that it would be a good thing if we had some bad times to teach labor a lesson. I asked him what he had ever done to disabuse the minds of labor as to overproduction, the introduction of labor-saving machinery and the like. I asked him further what his fellow manufacturers had ever done to place before the workers fundamental principles of 'industrial economics.' He had to admit that what he had done was conspicuous by its absence. Further, I wanted to tell him that he needed to take the beam out of his own eye before removing the mote from that of his brother. Capital has much to undo before it can go to Labor and teach it economic truths."

Getting down to the development of the argument, as it relates to present conditions, there is a concise statement which we have quoted below as to the fallacies which are common in the ranks of labor management and capital, and fallacies which must be eliminated if we are to work out the industrial system so that it will be permanently of advantage to all parties, and so that the present strife will be decreased instead of increased.

These fallacies, placed alongside the things which must be done in order to offer the solution of the present difficulties, give a pretty clear picture of the situation, and indicate that thoughtful men in industry are studying these subjects without the atmosphere of prejudice which has prevented an understanding of their significance heretofore.

No Room for These Fallacies

"Here are the fallacies which must have no part in our new industrialism:

"A—*On the part of labor*—(1) That production should be retarded and the introduction of labor-saving machinery frowned upon and fought against, in order to make more work for more people and guard against over-production.

(2) That it creates wealth and should therefore enjoy the fruits of such creation, the argument being that in the last analysis the products of industry are the work of labor.

(3) That Capital is opposed to it, because it gives it no say in management nor a share in the profits of industry.

"B—*On the part of management*—(4) That it is the boss and that its decision is final because responsible for results.

(5) That labor is commodity to be purchased according to the law of supply and demand the same as material.

(6) That it is only accountable to capital.

"C—*On the part of capital*—(7) That it is the controlling factor because it supplies the funds.

(8) That it has no further obligation beyond supplying the funds.

(9) That all the profits belong to it.

(10) That labor is opposed to it because of strikes and agitation.

"In this present era of conflict, of industrial unrest and general dissatisfaction, welfare plans, shorter hours, higher wages, union recognition, bonus and incentive plans, lower cost of living and the like are not going to satisfy the desires of the masses. These things without others, more important and fundamental, will leave them no better off than they were before, simply because they do not meet the economic demands, nor do they provide for self-expression of our people, for 'industrial democracy,' for a say in the conduct in industrial affairs, for real human development.

"The world wide tendency toward revolution is not due so much to desire for *political* changes, as to demand for *economic* changes. The clash we see on all sides is not aimed at kings, queens, emperors and presidents, but at unfairness, autocratic domination, inequality, unemployment and the like. What the masses the world over have in mind are houses, food, farms, clothes, jobs, wages, participation, representation in affairs and the like.

"Labor claims that it has had no say in the determination of shop rules; the rate of wages; whether labor shall be paid by the bonus, premium, differential piece work system or some modification of these; what shall be the time allowed for the perfromance of a task or the accomplishment of a so-called standard of efficiency; hours of labor; industrial education that should be given the workers; what methods should be established by which the workers might receive a hearing; what should be the basis of hiring and the grounds for discharging; what facilities should be provided for performing the work; whether bargaining should be collective or individual.

Real Partnership Necessary

"There will never be a real democracy in industry until we take steps to give Labor a say in matters that had to do with their side of things. If a partner in business, it should have a partner's voice. If there are two sides to a question, we will not get very far if we hear but one side.

"Labor wants its say in the conduct of affairs, both political and industrial. It should have this way. Capital and Management want the same say. They should also have it. The consent of the governed, representation in affairs, liberty and the pursuit of happiness, are the basic principles in political democracy, and they should and must become the foundation of the industrial democracy that will come sooner or later.

"If we want industrial democracy to be a living, breathing reality in our lives, then the only answer is that Labor along with Management, should be given a share in the conduct of business. I do not care so much whether the plan adopted is the shop committee or conference plan, the House of Representatives and Senate plan, Labor on Board of Directors plan, or some other plan, so long as opportunity is given for frank and open discussion of matters of mutual interest."

This discussion does not, of course, take into account the changes which must come about in the social and political aspect, in view of these necessities in industry. It does not take into account the result of the neglect by industry of this responsibility for educational matters in the primary schools for the proper development of housing and for its share of responsibility in political development.

It does, however, suggest some of the things which are necessary from an industrial standpoint, and it is important for its suggestions, and also as an indication of the tendency of the industrial conception at the present time.

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Testing Pyrometers

THE pyrometer has three parts independently liable to error, viz., the thermo-couple, the measuring instrument and the lead wires. In testing pyrometer installations, provision should be made for the maintenance of a standard of temperature and for the convenient comparison of this standard with the instruments to be tested. The standard should consist of at least one platinum-platinum-rhodium thermo-couple previously calibrated to an official standard and a potentiometer. This standard may then be used for checking the secondary instruments, which should be done frequently enough to ensure against faulty calibration.

The standard couple should be used with a potentiometer, which is the recognized instrument for electromotive force measurements. It should be able to accommodate with full sensitivity both platinum and base metal couples. For use with the thermo-couples and potentiometers there should be a large electric furnace having a zone of uniform temperature extending at least 12 in., throughout which temperature variation is not in excess of 20 deg. Fahr. The furnace should have an internal cross section of not less than about 2½ in. in diameter.

Tests of Aeronautic Instruments

Need for Many New Instruments by Air Forces Led to Great Expansion of One Section of the Bureau of Standards—Classes of Instruments Required, and Some of the Difficulties Met With

By P. M. Heldt

THIS is the sixth of a series of articles prepared by Mr. Heldt from the research records of the Bureau of Standards in Washington. Previous articles have covered:

1—*Dry Cell and Storage Batteries*

2—*Tests of Airplane Radiators*

3—*Altitude Engine Test Laboratory*

4—*Tests of Ignition Apparatus*

5—*Carbureter Testing*

Additional articles covering other subjects will appear in subsequent issues.—EDITOR.

AT the time the armistice was signed the Aeronautic Instrument Section of the Bureau of Standards comprised about forty technical men, of which about one-half were on the Bureau staff while the rest were assigned to work in this section by the military departments. The enlisted men acted in the capacity of assistants.

While the section, as a separate branch of the Bureau of Standards organization, was established at the beginning of the war, it was really an expansion of a section which had been in existence for 6 years previous to the war and which concerned itself with altitude measurements chiefly in connection with ballooning and aeronautical work, but also in connection with mountaineering.

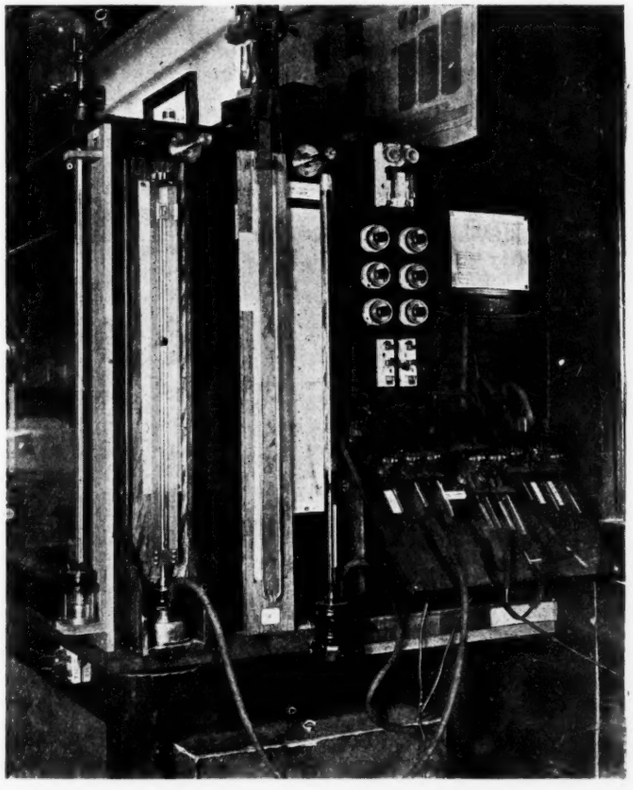
The men who conducted this work formed the only small group of technical experts in altitude measuring instruments in the country, and all of the altimeters used by the Army and Navy for 6 years previous to the war had been tested there. Another thing that rendered this section of the Bureau of Standards of considerable value to the Services when the war broke out was that these men were familiar with the status of the instrument industry throughout the country and were able to give the Army authorities data as to the capacity of the different instrument makers and their special experience.

Low Temperature Problems

While previous to the war the activity of this section had been confined to the development of altitude instruments, upon the outbreak of hostilities its field of activity was widened to include other aeronautic instruments. A special reason for entrusting this section with the work connected with the other instruments used in flying was that there are three particular difficulties with which all manufacturers of aircraft instruments have to contend and with which these experts of the Bureau of Standards had become familiar in their pre-war experience. These difficulties are due to the extremely low temperatures in the upper atmospheric regions, to the vibration of the engine and to the strong centrifugal force to which all instruments on an airplane are subject while banking. Provisions for compensating for the effects of these factors must be made in all kinds of airplane instruments.

Following is a list of instruments that are commonly used on airplanes and in connection with which the Bureau has done research and testing work: Altitude measuring instruments, including the ordinary altimeters, recording altimeters and statoscopes, the latter used in balloons to tell whether these are rising or falling when it is desired to keep them at a constant level, and in airplanes under test when it is desired to fly in an absolute horizontal plane; rate-of-climb indicators; speed indicators, including instruments for determining the air speed or the rate of progress of the airplane through the atmosphere, which also tells the pilot whether he is going fast enough not to be in danger of stalling; tachometers giving the speed of rotation of the engine shaft; inclinometers, of which there are two types, namely, the liquid and the gyroscopic, which show the angle of inclination of the plane; pressure gages for showing the pressure on the lubricating oil and the pressure on the gasoline in the fuel tank; also gasoline tank gages and radiator thermometers.

As pointed out, the reason for the expansion of the altimeter section of the Bureau at the beginning of the war,



Mercurial standards and vacuum control board of aeronautic instrument test chamber

so as to take in other aeronautic instruments, was the fact that the technical problems arising from conditions of flight are the same for all kinds of instruments. The work which has been done by this section during the period of the war may be briefly summarized as follows:

What the Section Has Done

1. The section furnished the authorities a list of manufacturers who would be in a position to take up large scale production of aeronautic instruments.

2. The section prepared technical specifications for the instruments which were to be produced. These specifications were in most cases adopted by the Army without any important changes so far as the technical features were concerned.

3. It tested a certain small fraction of all instruments delivered to see that no new sources of error were creeping in, and also tested samples of any new types of instrument to determine whether they were suitable for the work for which they were intended. Practically all contracts for airplane instruments were based on these tests.

4. The section developed some improvements in instruments and continually kept in touch with the manufacturers to help them to keep up their product to the standard of the specifications laid down.

The writer asked those in charge of this work whether any practical instrument had been developed for determining the absolute rate of progress of an airplane or its speed relative to the ground, and was told that there were two kinds of instruments for this purpose.

One kind is limited to use during the day and when there is no fog, when the ground can be seen. The use of this kind of instrument is based on a process of triangulation. The altitude of the plane being known, and an object on the ground being observed at the beginning and end of a certain interval, it requires only the solution of a problem in triangulation to determine the absolute speed of the plane.

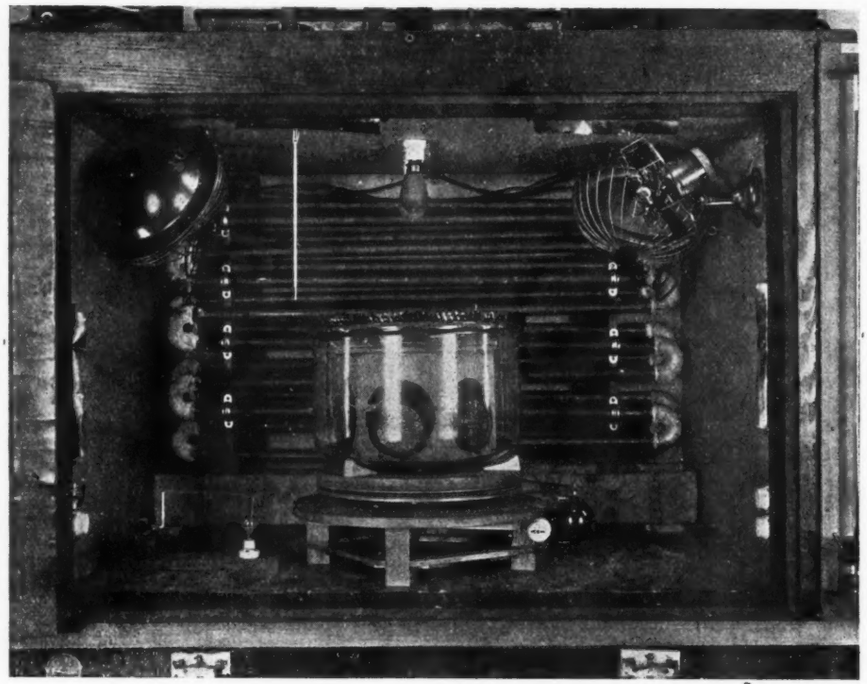
The production of the other kind of an instrument, namely, one which will give the absolute speed of a plane when the ground cannot be seen has not been satisfactorily solved except in theory. It is one of the great outstanding problems in connection with aircraft instruments, as is also that of a non-magnetic type compass.

Quantity Production Methods

Owing to the rapidity with which results had to be obtained and the fact that our allies had been engaged in the war for over 2 years when we entered it, American manufacturers in the majority of cases contented themselves with the adaptation of British and French designs. In doing so, the Bureau with its extensive collection of foreign instruments, was of assistance.

When the war broke out here the only instrument in production in the United States was the altimeter, which is a type of aneroid barometer with a flat circular corrugated diaphragm. What developments were made in the United States in connection with instruments of foreign origin were mainly with the object of reducing the cost of manufacture.

All foreign instruments, and especially those built in France, involve a great deal of hand work, and the number of workmen in this country experienced in work similar to that required on these instruments was very limited, hence quantity production methods had to be worked out. The great trouble which has been experienced with aircraft instruments so far has been insufficient accuracy, which is largely a matter of quality of materials and adjustment of the different levers, cams, springs, diaphragms, etc. A case in point is furnished by the ordinary altimeter, the characteristics of which vary a great deal according to whether the diaphragm is flat or slightly concave or convex, when first assembled with the pointer standing at zero on the altitude scale.



Viewing the aeronautic instrument test chamber. Note that conditions of low temperature and centrifugal action are simulated

Tachometer for Aircraft

AN illustrated description of the Morel electric tachometer, which has been largely used on German airplanes, is printed in *Der Motorwagen* for Dec, 10, 1918. It consists of the combination of a direct-current generator driven from the engine by suitable means and a moving coil galvanometer which is graduated in r.p.m.

In a magnetic field, formed by a number of magnets of high tungsten alloy steel, a drum armature revolves having a commutator and a number of spring contacts for collecting the current. The magnets are so constructed as to give a constant field. The transmitter in the latest design is driven through an intermediate shaft and flexible coupling. The whole of this transmitter is contained in a casing fitted with a special dust-proof bayonet-joint cap, while the armature is driven through gearing. For airships, motor boats, etc., the transmitters are fitted with bases.

The receiver galvanometer comprises the moving coil, wound on a pressed copper frame, and fitted with spiral springs which serve at the same time as current leads from the transmitter. The movements of the coil are transmitted by teeth to a pointer fixed to the indicator spindle.

German Engineering Standards

THE Council of the German Industrial Standards Committee has agreed to the following conditions becoming standard practice:

(a) The uniform temperature of reference for gages, etc., shall be 20 deg. C.

(b) In view of practical and theoretical advantages, the "zero" line shall be taken as the "limiting line" in connection with standard systems of fits.

(c) The S. I. (System International) and Whitworth systems of standard screw threads shall both be considered as standard.

The Lubrication of Motor Cars

Engine Lubrication Systems Dependent on Engine Load—Test Results from Crankcase Lubricant After 100 Hours' Use — Lubrication of Clutch Pilots and Transmission Boxes—Loss in Efficiency Due to Too Much Oil in Gear Case

By Capt. G. W. A. Brown

IN this paper, presented to the Institution of Automobile Engineers of Great Britain, Capt. Brown discusses chiefly problems in the lubrication of chassis components, as the lubrication of the engine has, according to him, received a great deal of thought and care, which cannot be said of other important parts of car mechanism. Each part is taken up in turn, and the problem of its efficient lubrication is discussed, various conventional practices being strongly criticised. The author does not believe in the common method of filling the transmission box and rear axle with grease, holding that oil lubrication is much more satisfactory. Only enough oil should be put into the cases so the gears will dip into it. Otherwise the efficiency will be lowered, owing to the unnecessary churning of the oil.—EDITOR.

WHEREAS a great deal of thought and care has been lavished on the lubrication of the engines of motor cars, the lubrication of the remaining components of the chassis, such as the gear box, universal joints, live axle, steering gear, etc., has been, to a great extent, neglected. As 90 per cent of the failures of cars are caused through wear, the author is emboldened to put before members of this Institution a few suggestions for the improvement of the oiling of these parts as an incentive to further experiments and to stimulate research, which would result in much benefit to both the manufacturer and the user.

The investigation of this question may be conveniently divided into six parts:

I.—The engine.
II.—The transmission, including:
- Clutch bearings;
- Flexible connection between clutch and gear box;
- Gear box;
- Universal joints, with particular reference to those of the Hooke's type;
- Propeller shafts and torque tubes;
- Back axle reduction and differential gear.

III.—The steering gear.
IV.—The suspension system.
V.—Road wheel bearings.
VI.—Oil retaining devices.

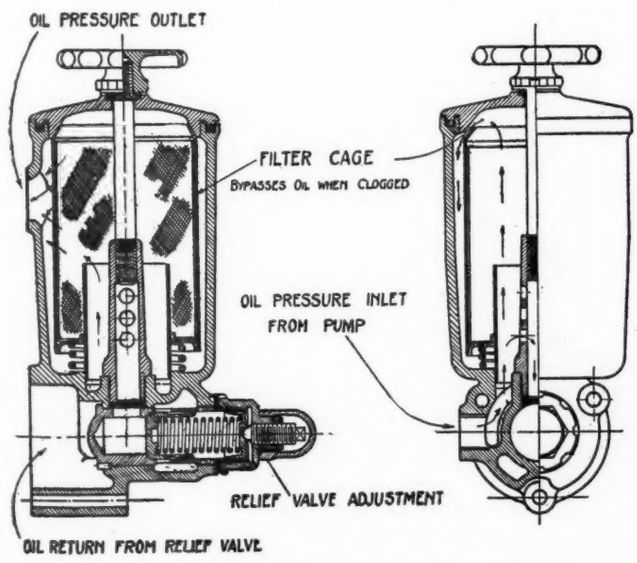


Fig. 1—Pressure filter as used on aero engines

I. The Engine

As previously stated, the engine is the only portion of a car in which the question of lubrication has been at all seriously considered. There are, perhaps, two exceptions to this generalization, and the author proposes to deal with them at a later stage. These exceptions are the Fergus car and the Marmon car.

There are two basic methods by which engines are lubricated:

(a) The pressure system;
(b) The splash system.

Other systems of lubrication are based on one or other or a combination of these two methods. The author does not propose to enter into any lengthy discussion of any of these systems, but will content himself with a few remarks upon some examples of the latest practice.

Two features of aero engine design may usefully be mentioned, namely, the dry sump and the pressure filter—the dry sump because it enables the oil to be kept at a lower temperature than would be the case if it were always stored in a portion of the crankcase; the pressure filter because its use permits of a very fine gauze without danger of starving the supply. Fig. 1 shows the general features of a type used in aero engine practice. The possibility of any reduction in circulation owing to the gauze becoming clogged is obviated by making it act as a by-pass valve in the manner shown by the right-hand view. With reference to the dry sump, it should be mentioned that this principle was first employed on at least two well-known types of British racing cars which competed in Continental races and competitions at Brooklands prior to the war.

Some designers have provided means of varying the oil supply at different engine speeds and loads, but all the systems of this kind that the author has come across are interconnected with the throttle. The tilting trough of the Knight engine is familiar to all of us. Messrs. Rolls-Royce adopt a method of opening a by-pass in the oil pressure pipe after a certain throttle position in order to give an extra supply of oil direct to the cylinders, while the Marmon oiling system is provided with a piston valve which is operated by the depression in the inlet pipe. At low engine speeds this piston valve uncovers a by-pass valve, so reducing the pressure throughout the whole of the oiling system. These devices are

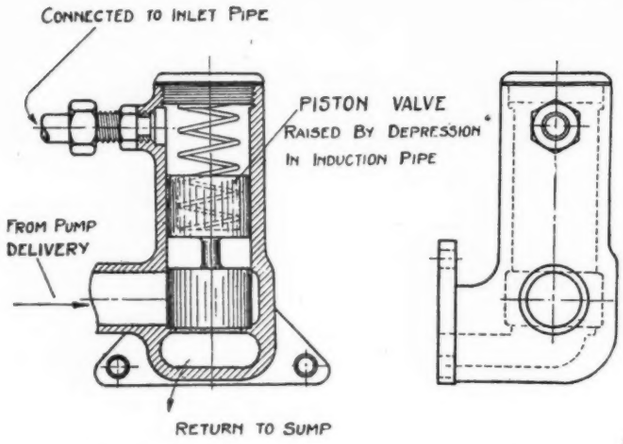


Fig. 2—Marmon oil pressure control valve

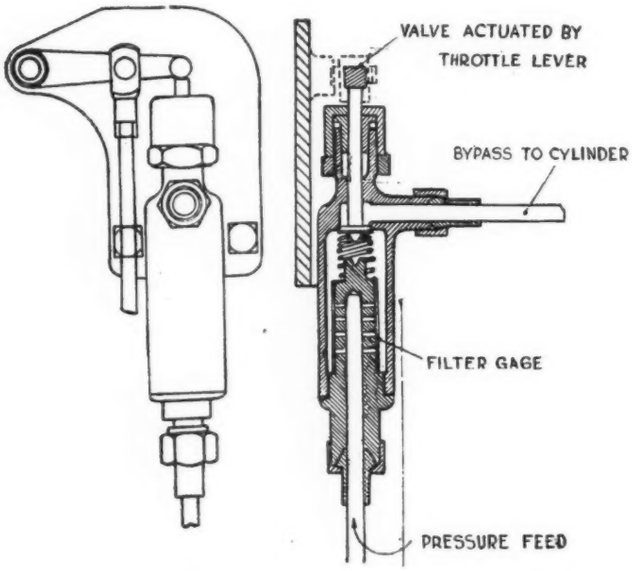


Fig. 3—Rolls-Royce throttle-controlled oil feed to cylinders

illustrated in Figs. 2 and 3. The author is not satisfied that any of these systems are correct, for the reason that it is possible to have extremes of engine speeds and loads for any given throttle position.

The usual practice in engine lubrication is to fill the sump with a given quantity of oil, which, according to most instructions, remains in use up to two or three thousand miles' running. It will be generally accepted that the longer the oil is used the thicker and darker it becomes, and, in order to ascertain the degree of deterioration caused by long periods of running, analyses were taken from:

(a) A standard proprietary brand of lubricating oil as delivered by the makers;

(b) A quantity of the same oil after 100 hours' running in an aviation engine of high power under full load.

There is very little difference in the actual test figures, but, as a slight reduction is shown in the co-efficient of friction, it is reasonable to suppose that this will continue to increase with the age of the oil. The original lubricating oil was of a yellow-green color and free from sediment, while after 100 hours' running it became deep black. On examination, this oil was found to contain a considerable quantity of carbon specks or particles in suspension. These particles, magnified fifty diameters, gave a dimension of 0.001 mm., and were so fine as to pass all the usual methods of filtering. We were able, however, to separate the carbon specks by filtering through 3 per cent Fuller's earth or with animal charcoal. The solid carbon particles so extracted amounted to 0.1 per cent, carrying also traces of iron and copper.

Samples of the oil were tested on a Thurston machine, and the general data and characteristics are shown in Table I. It will be noticed that the figures given prove the theory that the specific gravity is entirely independent of the viscosity, as, after use, the specific gravity has increased, while the viscosity has decreaed.

TABLE I

Analysis of Lubricating Oil Before Use and After 100 Hours' Running in Aero Engines

Specific gravity at 60 deg. F. before..... = 0.893
Specific gravity at 60 deg. F. after..... = 0.907
Specific gravity at 60 deg. F. used and filtered..... = 0.892
Viscosity (Boverton Redwoods):

Standard refined rape oil.	50cc. Time, 7m. 7½s.	T. 60° F.
Unused oil	50cc. Time, 49m. 20s.	T. 60° F.
Used oil	50cc. Time, 47m. 16½s.	T. 60° F.
Used oil, but filtered	Time, 50m. 47s.	T. 60° F.
Unused oil	50cc. Time, 9m. 5s.	T. 112° F.
Used oil	50cc. Time, 7m. 35s.	T. 112° F.
Used oil, but filtered ...	Time, 10m. 31s.	T. 112° F.

Percentage of acid:
Before use ..... = 0.211
After use ..... = 0.250
Saponification figures:
Before use ..... = 17.60
After use ..... = 19.24
Co-efficient of friction:

Taken on Thurston's machine with white metal bearings

	Temp.	Revs. per Min.	Pressure per In.	Total Pressure	Co-efficient of Friction
Unused clean lubricating oil	50° C.	1,800	60	225 lb.	0.035
Dark oil after 100 hr. running	50	1,800	60	225 lb.	0.044
Filtered oil (carbon particles removed)	50	1,800	60	225 lb.	(0.041) (0.0380) 0.039

It is the practice of one well-known enemy engine builder to use a small auxiliary plunger driven from the main oil pump, which is continually drawing a supply of clean oil from the tank, and forcing it into the circulation along with the oil already in use, thereby making up for wastage and preventing, or, at least, reducing, the deterioration of the oil.

II. Tranmission

Clutch Pilot.—Lubrication of the clutch pilot is, with few exceptions, a matter of chance, or a Stauffer, which is much the same thing. In cars in which the engines are lubricated on the pressure system, however, some makers fit a non-return valve in the clutch end of the hollow crankshaft in such a manner that depression of the clutch pedal opens this valve and liberates a small quantity of oil. Fig. 4 shows such a device.

Flexible Connections.—Except, possibly, in engines and gear boxes of unit construction, it is necessary to have a flexible connection between the clutch and the first motion shaft. These connections are usually of the types illustrated in Figs. 5, 6, 7 and 8.

It is the author's complaint that there is no recorded case

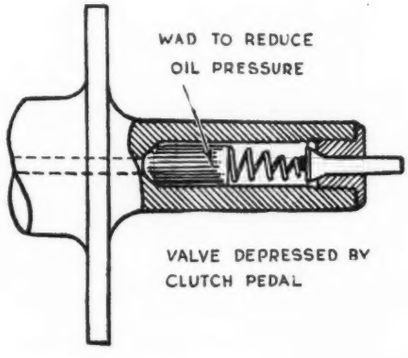


Fig. 4—Non-return valve fitted in the clutch end of the hollow crankshaft to reduce oil pressure

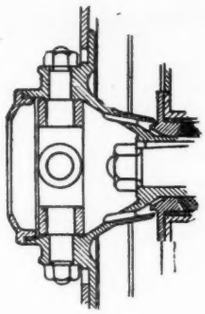


Fig. 5

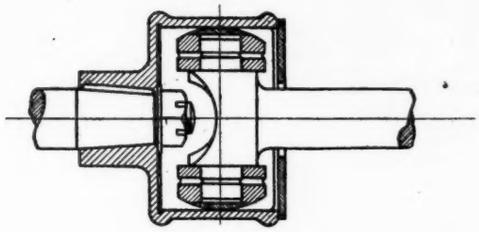
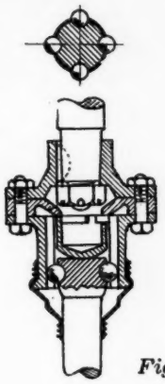
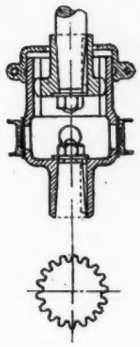
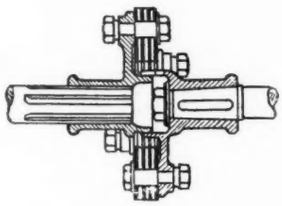


Fig. 6





Figs. 7 and 8



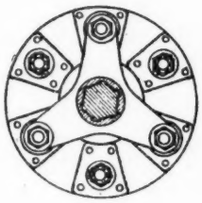
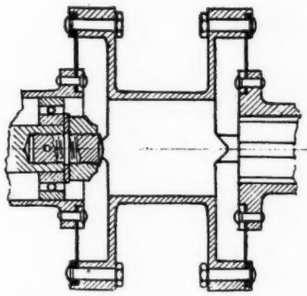
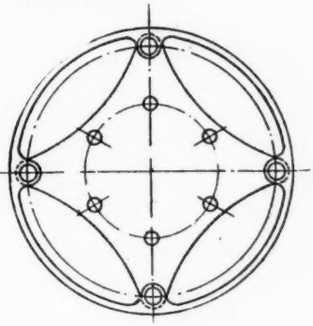


Fig. 9





Lubrication of universal joints

Fig. 10

of any considered scheme for the lubrication of such connections. It may, of course, be argued that leather, fabric, or flexible metal joints may be used for this purpose, and Figs. 9 and 10 show those in most common use, but on account of their diameter and weight, for any reasonable torque, they render gear changing difficult, and, with high-speed engines, are apt to cause vibration on account of lack of balance, which increases with their age. In fact, so poor an opinion has the author of this kind of joint that, although he is the inventor of one of the best-known forms of it, he does not advocate its use.

Gear Box.—It is astonishing that the crude method of lubricating the gear box by filling it with a mixture of grease and oil has persisted so long. To the author's mind, this method should be classed with what an eminent member of this Institution has cleverly called "the unmechanical legacies of our designer-forefathers." The result of this scheme is an immense loss of power and sometimes of lubricant as well. Piles of grease can often be seen in the undershield or surrounding the gear box of many cars after a few hundred miles' running, not always due to design or workmanship, but simply because the over-zealous owner-driver has been too liberal in refilling the box, with the result that the lubricant has been literally forced out by the churning action of the gear wheels inside the casing, which in many cases embraces the gears and other mechanism generally far too closely. In these cases it can safely be assumed that the efficiency losses are even more serious than if the casing was filled only with its proper quantity.

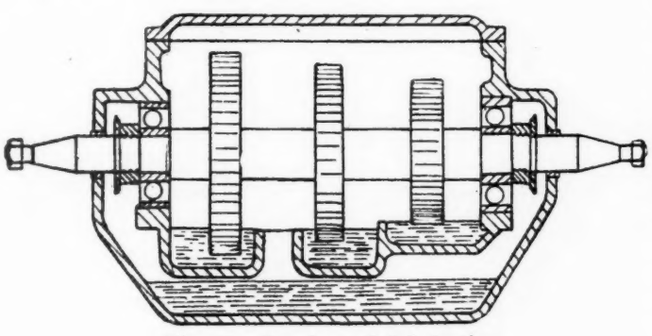


Fig. 11—Gearbox oil lubrication

A test of the 32 hp. "Leyland" gear-box was undertaken by the National Physical Laboratory (Report N.P.L., 1914-15, pp. 99-100), which gives the efficiency of the direct drive as being only 74 per cent when the box was full of oil, while, when a quarter full, the value was 97.5 per cent. It is evident that, had grease been the lubricant, the efficiency would have been lower still.

It is to be regretted that no tests with this gear-box were made with any other than the direct gear. Further figures as to efficiency on the different gears would be appreciated should any members have any data on the matter.

A method of oiling the wheels of a gear-box by making each dip into a trough in which oil is maintained at a constant level by a pump is illustrated in Fig. 11.

It has always been the author's practice to put only sufficient oil into the gear-boxes of racing cars that the teeth of the largest wheel alone would dip, but the best method would appear to be to cause a jet of oil to play upon the intersection of the gears on the side of engagement, as shown in Fig. 12. It will be noted that, in this design, white metal bearings are fitted for the shafts, and they are oiled under pressure: it is the author's experience that these are preferable to ball or roller bearings, making, as they do, a quieter and sweeter-running gear-box, without diminishing efficiency. In any case, it seems an unnecessary refinement to fit ball bearings to a device which, as usually lubricated, is more fitted for determining the mechanical equivalent of heat than anything else.

It will be seen on again examining Fig. 12 that this system, like the engine, is self-contained, and the quantity of lubricant is capable of being controlled by a suitable level gage, while at the same time, the pressure feed renders it possible to apply efficient and certain lubrication to the clutch bearing and universal joints on either side of the gear-box, wastage being prevented by gravity return to the sump, and the provision of effective oil retainers.

In those cars in which the engine and gear-box are combined in a single unit, the lubrication of the clutch pilot, gear-box, and universal joint is a more simple matter. In the "Morris-Oxford," for instance, the oil is circulated by the flywheel to the engine on the one hand, and to the gear-box and universal joint on the other. The Fergus car has a pressure system in which an engine-operated gear-wheel pump supplies oil to almost every moving part on the chassis.

It is debatable whether it is better to supply the different

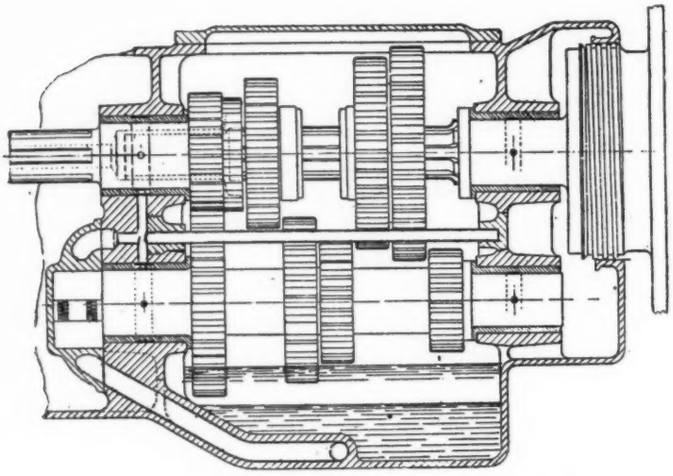
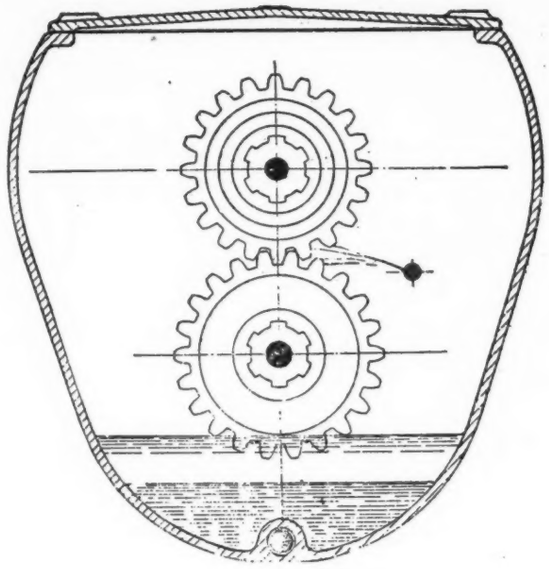


Fig. 12—Pressure oiling of transmission plain bearings



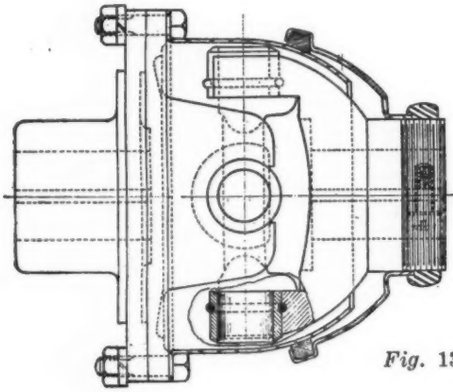


Fig. 13

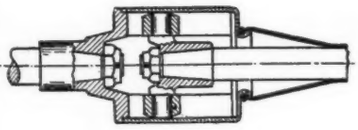


Fig. 14

Figs. 13 and 14—Housings of grease-lubricated universals

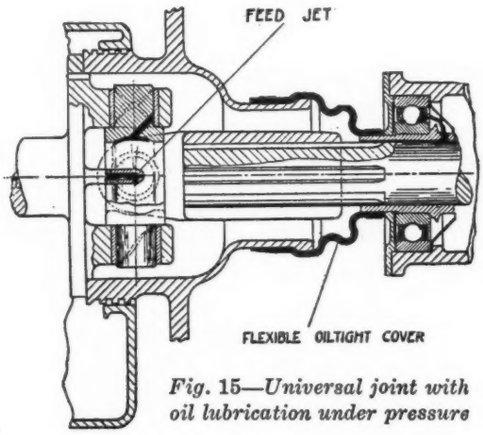


Fig. 15—Universal joint with oil lubrication under pressure

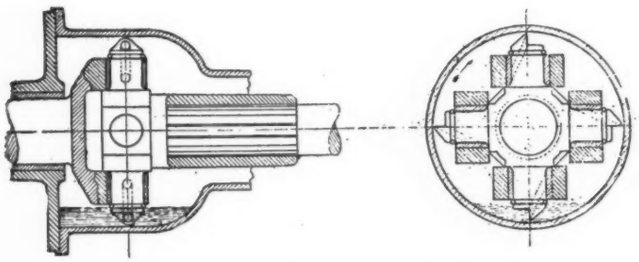


Fig. 16—Universal joint with splash lubrication

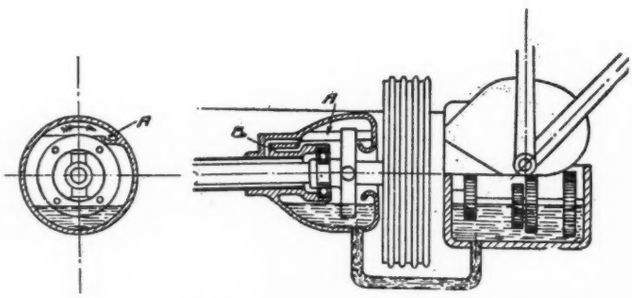


Fig. 17—Means for maintaining oil level in universal

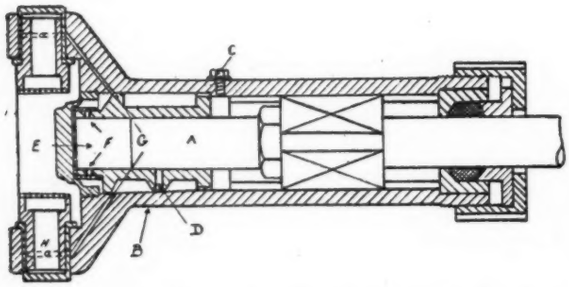


Fig. 18—Oiling universal by plunging action of propeller shaft

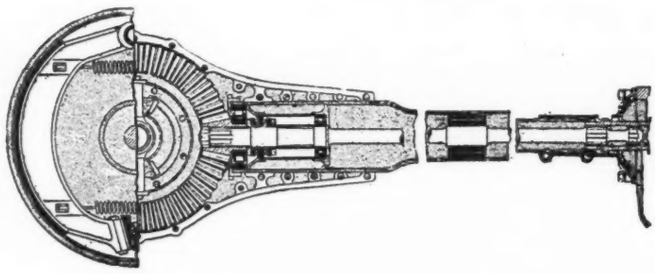


Fig. 19—Fergus rear axle lubrication system

components of the chassis from one source, as just explained, or to arrange a self-contained system of lubrication to each of the important units, as outlined by the author. Although in the latter case the pumps are duplicated, they are simple and nearer their work, and the extensive system of pipes and jointing necessary for the former scheme is avoided, thereby decreasing the risk of leakage and rattle through loose or broken pipe junctions.

Universal Joints—Where universal joints of the Hooke's type are employed, the author finds that their bearing surfaces are commonly loaded to pressures exceeding in some cases 3000 lb. per sq. in. Yet it has been thought sufficient to lubricate them by putting them into an articulated spherical housing in the best examples, or, in the worst, a part-metal and part-leather covering, and filling the casing with grease (see Figs. 13 and 14). The net result is that, when some of the lubricant has worked its way out of the casing, as it invariably does, centrifugal action takes place and the bearings soon run dry. On account of this action, it is essential that Hooke's type universal joints be lubricated from the inside. Fig. 15 shows a method which is favored by the author. In this scheme, oil is supplied under pressure to the center of each flexible joint by a suitable tube or jet. The oil issues from this and is caught by the hollow centre of the trunnion or star-piece. Holes are drilled from the centre to a point near the mouth of the bearing in each pin, and the bush is suitably grooved, so that, as long as the jet is delivering oil, centrifugal force will convey it to all bearings. The outer ends of the bushes are left open to allow of the used oil being thrown on to the casing, from whence it is returned to the sump by gravity.

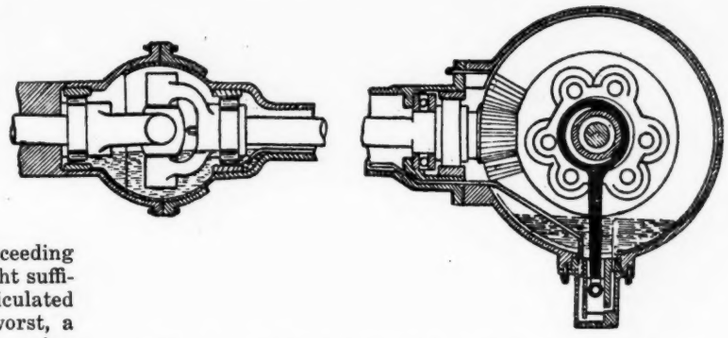
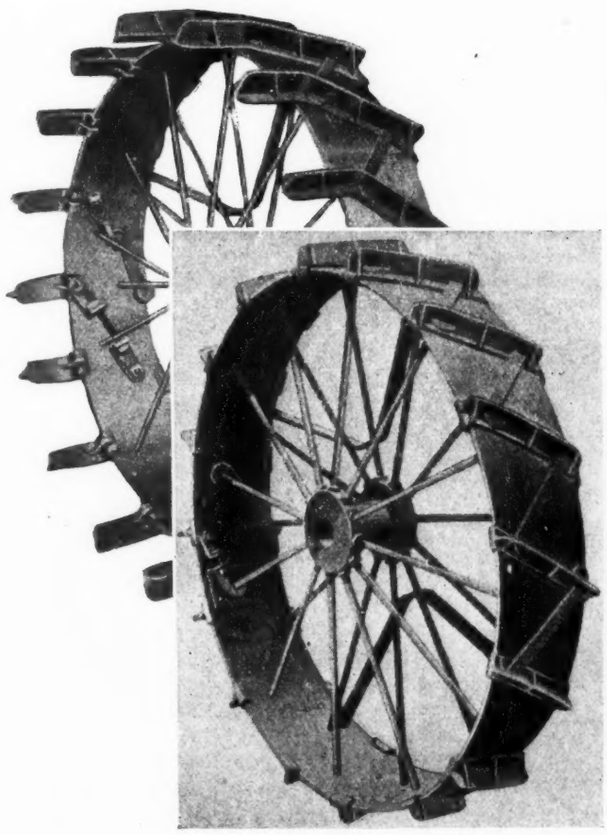


Fig. 20—Walford suggested method of rear system lubrication

Fig. 16 illustrates a scheme where the joint revolves in a stationary casing. It will be seen that the arms of the star-piece are hollow, and are fitted with scoops which dip into the oil contained in the casing as they revolve. The oil level is maintained by a pump, or by such a device as is illustrated in Fig. 17; Fig. 18 depicts an ingenious method of oiling the universal joint by the plunging action of the propeller shaft.

Propeller Shaft and Torque Tube—The oiling for the front bearing of the propeller shaft and the torque tube is susceptible of varieties of treatment. Fig. 19 represents that adopted in the "Fergus." Fig. 15 is a design of the author's, while Fig. 20 was suggested in an article by Capt. E. W. Walford in *The Autocar*. *(To be continued)*

Loxon Lugs for Tractors



PRACTICALLY all lugs which have been used on tractor wheels so far require bolting to the wheel rim. This is a tedious operation, and rather than spend the time necessary to remove the lugs, the farmer is apt to leave them on whether they are needed or not. When the tractor is doing only light work it is much better to run without the lugs, as the use of the latter always entails some loss of power. For driving on improved roads the lugs must be removed.

A design of quick detachable lug has recently been placed on the market by the Universal Lug Co., Cicero, Ill. There are two principal kinds of parts, the lugs proper, and links. The lug is made in T form, in various heights and sizes. On both ends of each lug is a hook or clamp which fits the thickness of the rim. The key lug, which is placed on the rim first, has a swivel arm attached to one of its rim hooks, this arm fitting into the eye of the rim keeper. After one lug has been placed on the rim, a link is inserted, then another lug is put on, then another link, and so on. The lock lug has a small bracket fastened to one of its rim hooks, with a hole bored through it for a bolt. A rim bracket is permanently secured to the inside of the rim and the locking bolt is then inserted in the lug bracket and the rim bracket, and its nut is drawn up.

It will be seen that the lugs extend across the rim at an angle. Different spacings are used, from 9 to 12 in., according to the size of lug, etc. The general form of the lugs is T shaped, and a number of ribs stiffen the web of the T. Both the ordinary lugs, extending only across the rim, and extension lugs are furnished. While the major portion of the lugs extends across the rim at an angle of 45 deg., the extension part extends parallel to the wheel rim.

Loxon lugs are made in malleable iron, and it is claimed that they can be put on and removed in 5 minutes.

Factors in High-Speed Engine Development

Solution of Carburetion Problems—Making Thermal Efficiency and Horsepower Tests on the Road

By D. McCall White

(PART I—*Continued*)

IT is highly important that when engines are turning fast that the maximum stiffness should be obtained in the cylinders, connecting rods, crankshafts, and above all the crankcase should be extremely stiff and rigid in order to prevent weaving, bearings going out of line, etc., and thus causing vibration and other evils. Fig. 12 illustrates the Cadillac crankcase and method of webbing up for maximum rigidity.

Carburetion Problems

Carburetion is a difficult subject, difficult because of the quality of gasoline, which is becoming worse day by day. As the public becomes more critical of the performance of an automobile, the difficulties presented to the engineer become more acute. Undoubtedly, more heat must be applied to the manifolds to get proper and satisfactory carburetion, assuming that distribution is correct. We keep our manifold temperature around 170 deg. F. by means of thermostatic control, the thermostats being located in the water pumps, causing valves to close or open as the case may be, thus preventing circulation of water through the radiator should the temperature be low. This has been very satisfactory indeed, but with poor grades of gasoline, more than this has to be developed. Much has been talked about exhaust heated manifolds, but this requires extensive study, as too much heat is as bad as too little and it is possible to lose great power at the higher engine speeds unless great care is taken.

An interesting development is shown in Fig. 13, the illustration being the design for a cylinder having exhaust cast integrally with the cylinder block, completely surrounded with water except the wall next the intake manifold, same being located above the exhaust manifold, the idea being that as the gasses whirled, the heavier molecules were thrown against the intake manifold walls, and, falling to the bottom wall, were immediately volatilized by the heat from the exhaust impinging thereon, the remainder of the gases being at normal water jacket temperature. I designed this engine in 1915 and it was extremely successful, although was never put into production on account of increased radiator capacity being necessary. This layout savors a little as the forerunner of the much advertised hot spot manifold.

Many other devices are in use, such as combined intake and exhaust manifolds, but many of these are, in my opinion, merely an excuse to try to get rid of bad distribution, which is so prevalent, unfortunately, in many of our engines to-day.

The shuttered radiator is also quite a satisfactory layout, but requires considerable development yet owing to danger of freezing shutters shut, wind pressure causing shutters either to remain full open or shut, rattles, etc.

In the Cadillac four-cylinder 1914 type engine, there was used in the carbureter an electric heating element, Fig. 14, consisting of nichrome ribbon between mica sheets, which was attached to the upper surface of the diaphragm, that is, the plate which supports the venturi tube. The gasoline which condensed in the intake pipe and mixing chamber dropped down on to this diaphragm and was vaporized by the heater. In operation, current was put through the heater for a short time before starting, so that this diaphragm and the metal of the venturi tube were heated and any fuel on the diaphragm was vaporized. Fig. 14 shows general assembly of this device.

Horsepower on the Road

The need has often been felt for some instrument to measure the road resistance and horsepower, and a very interesting instrument was developed some years ago in England and has been used by my company since the advent of the eight-cylinder car for this purpose. Fig. 15 shows this instrument, known as the Wimperis accelerometer. It can be used to measure:

1—The road resistance of different kinds of roads or tracks, under various weather conditions.

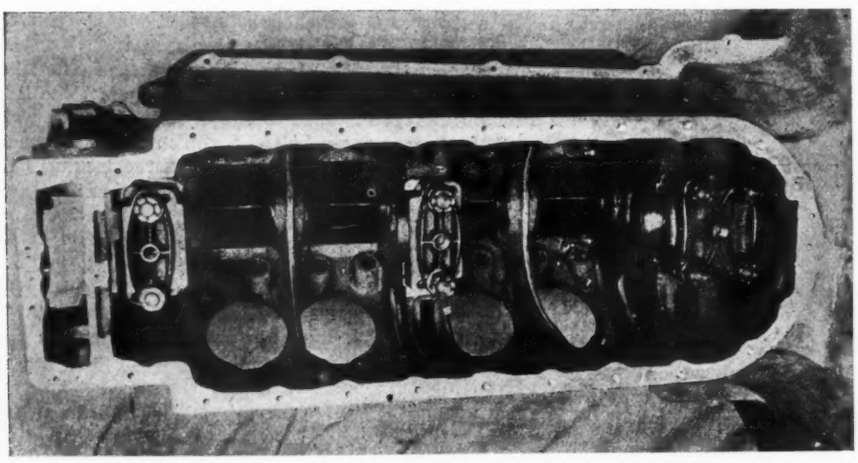
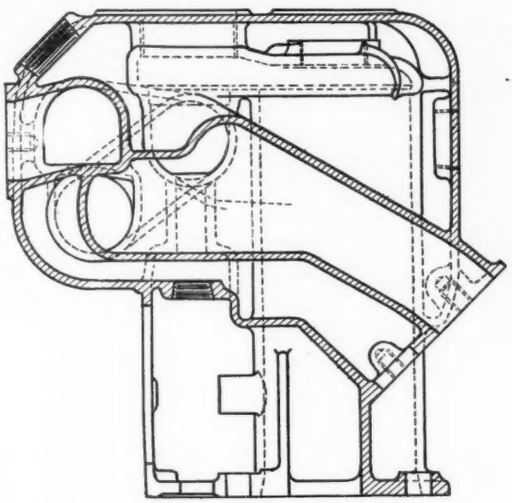


Fig. 12—Construction of the Cadillac crankcase, illustrating the method of webbing up for maximum rigidity

Fig. 15—Wimperis accelerometer used in making acceleration tests



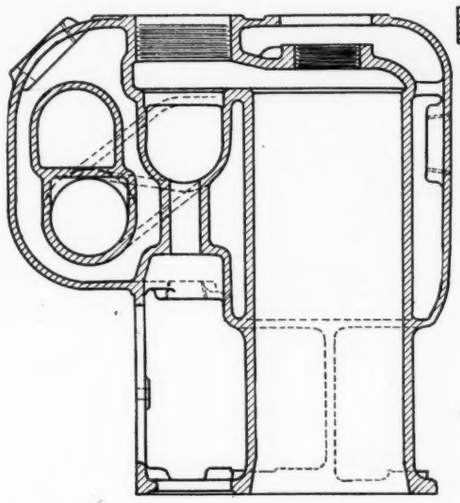


Fig. 13—Design of cylinder having exhaust cast integrally with the cylinder block

2—The amount of air resistance due to various forms of vehicles.

3—The mechanical and thermal efficiency of the engine at various speeds under real working conditions.

4—The brake horsepower exerted by the engine when running at various speeds on the road.

5—It is possible to trace step by step losses of power in transmission.

Since the advent of aircraft engines much has been learned regarding weight reduction. I am doubtful if many of the materials used in aircraft engines will ever be used in automobiles, for commercial production, but we have aluminum engines before us and there does not seem to be much doubt but what, perhaps in time, we will see many of these on the road and that possibly automobile engines will come down around 4 or 5 lb. weight per horsepower. We used to dream of 7 and 8 lb. with the accessories and I am in great hopes of seeing good development in this line.

In 1909 I designed a high-speed, four-cylinder engine weighing without flywheel 5¼ lb. per brake horsepower. The 2½ litre Crossley engine weighed 8¾ lb., neglecting flywheel, whilst the 3-litre Vauxhall in similar condition weighed 7¼ lb. per brake horsepower and the Prince Henry Vauxhall 5 lb., whilst the standard Cadillac eight-cylinder engine complete with generator but without flywheel weighs 8 lb. per brake horsepower.

Fig. 14 — Electrical heating element used in the 1914 Cadillac 4-cylinder engine

Application of High-Speed Engines to War Uses

Part II

LAST week the general fundamental factor entering into problems of high speed engine design were analyzed and in Part II, this week, a few examples are given of the use to which the high speed Cadillac 8-cylinder engine was put during the war. The following illustrations are of war apparatus using this engine.

Fig. 16 shows a searchlight outfit developed by the General Electric Co. through its engineer, Henry S. Baldwin, working in conjunction with my company, to whom I am indebted for the pictures. A generator having sufficient capacity to operate a 60-in. searchlight for war purposes was mounted on the chassis.

We believe that this is the largest lamp that has been produced, and the car has been thoroughly tested both in this country and for about 6 weeks in France prior to the signing of the armistice. We have records before us that it is a fact that it has never failed to meet any demands upon it as to power and structural features, and taking it all in all, it is

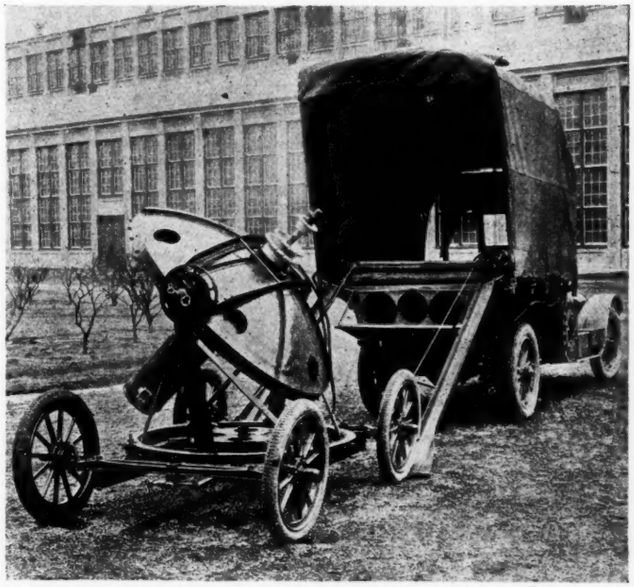
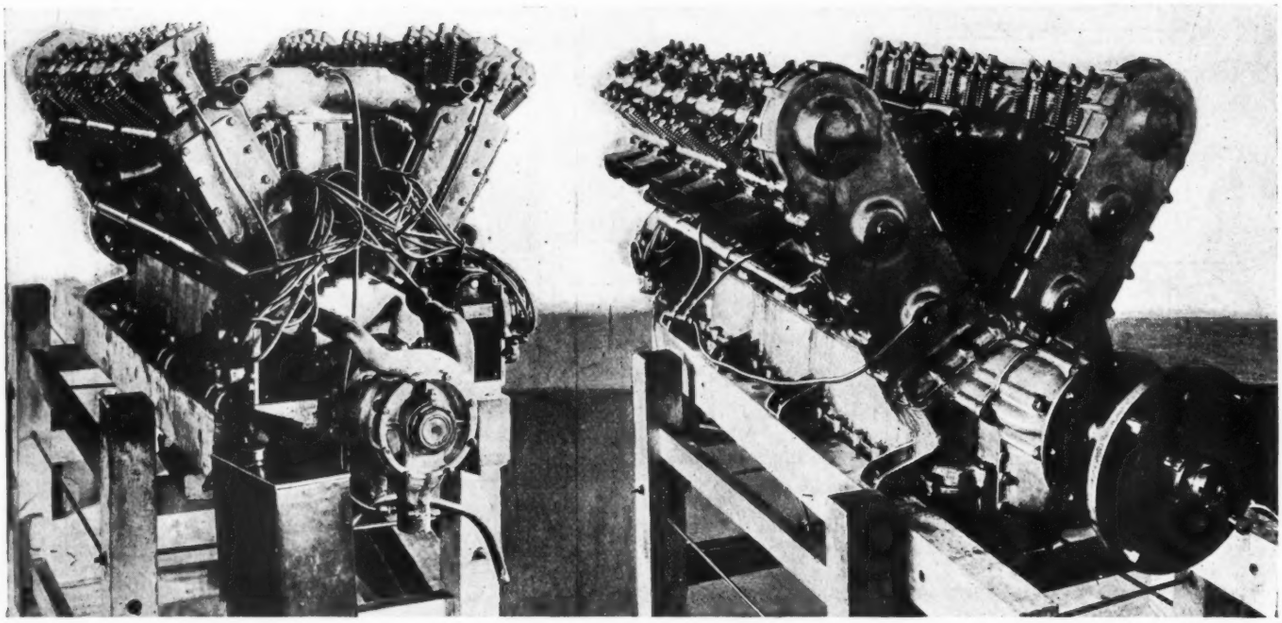


Fig. 16—Searchlight outfit developed by General Electric Co. It has a speed of 45 to 50 m.p.h.



Figs. 19 and 20—Twelve-cylinder high-speed aircraft engine designed by the author in 1915. The bore and stroke are 4 3/16 x 6, and it has twin exhausts and intakes for each cylinder and three carbureters mounted in the center

probably one of the most ingenious and successful devices which have been turned out, weighing about 11,000 lb. less than the outfit which was previously used for the same purposes and having a speed of 45 to 50 m.p.h. against a former speed of 15 to 20 m.p.h.

Another example of the use of the high-speed engine is in connection with tractors. Fig. 17 is a drawing of the 2½ ton U. S. A. artillery tractor, into which was fitted the Cadillac eight-cylinder engine. This tractor was capable, at a maximum burst, of traveling at the rate of 21 m.p.h., which is an engine speed of 3500 r.p.m. Its normal speed is around 12 m.p.h., the engine speed on high gear being 2000 r.p.m., the gears at these revolutions being as follows: First speed, 3.86 m.p.h., and second speed, 7 m.p.h.

The gear rations are as follows, the total reduction being between the engine and the track drive sprockets:

Direct, or high speed	13.01 to 1
Intermediate, or second speed	22.25 to 1
Low, or first speed	40.50 to 1
Reverse	48.65 to 1

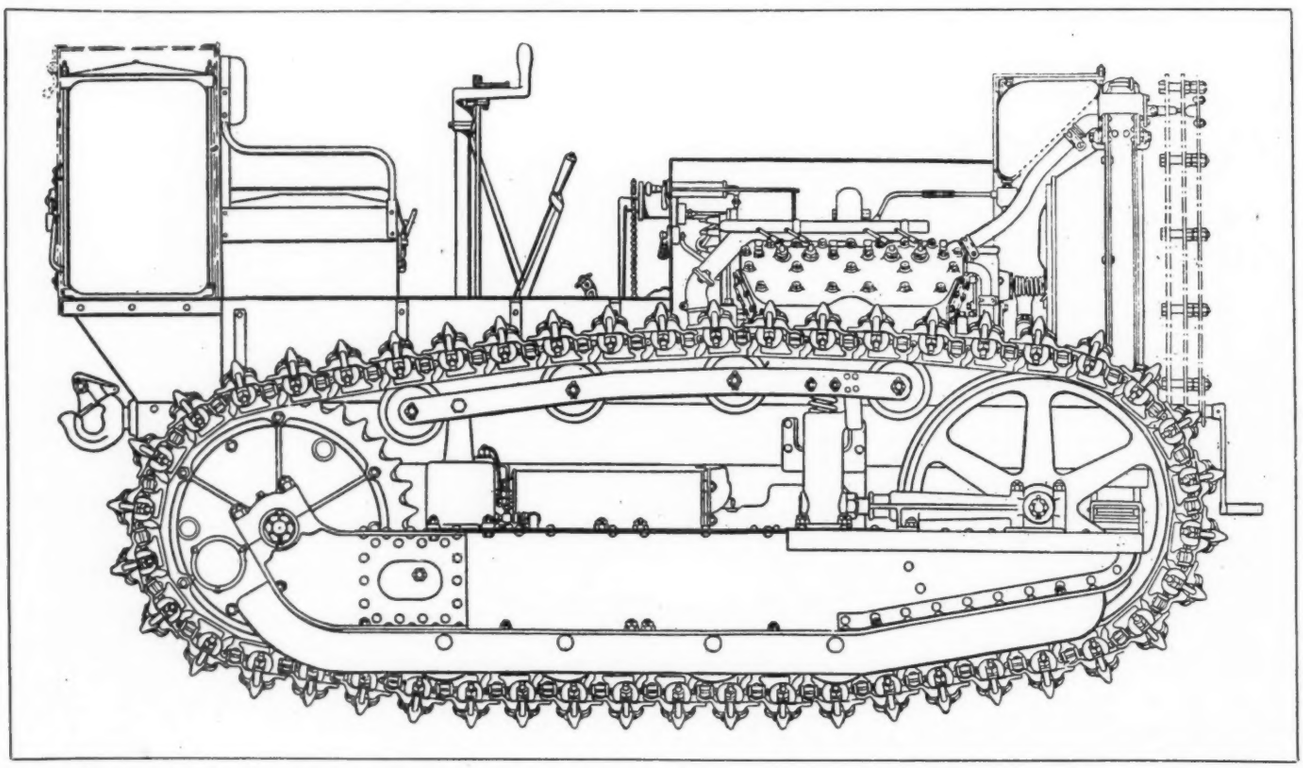


Fig. 17—Application of a Cadillac 8-cylinder engine to a 2½-ton U. S. A. artillery tractor. The normal speed of the tractor is 12 m.p.h., but it was capable at a maximum burst of 21 m.p.h.

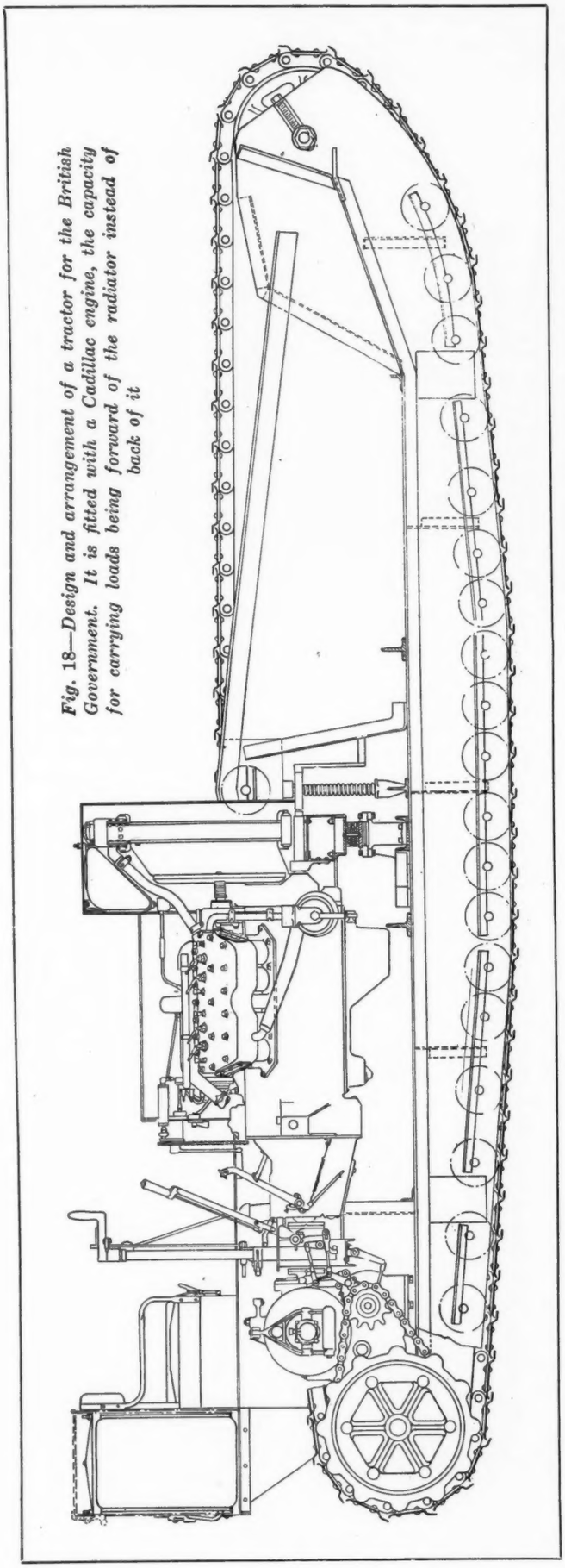


Fig. 18—Design and arrangement of a tractor for the British Government. It is fitted with a Cadillac engine, the capacity for carrying loads being forward of the radiator instead of back of it

Fig. 18 shows a layout of the Cadillac engine fitted to a tractor for the British Government, its capacity for carrying loads being forward of the radiator instead of behind it as was the case in the 2½-ton U. S. A. tractor.

Figs. 19 and 20 show a high-speed aircraft engine designed by myself in 1915. This engine had twelve cylinders, 4 3/16 by 6, having two exhausts and two intakes per cylinder, three carbureters mounted in the center, and owing to inability to obtain battery ignition, the engine was tested out with two twelve-cylinder magnetos. The design had a dry crankcase so far as oil was concerned, having two oil pumps with a cooling system and geared-down propeller, as the engine was designed to pull 350 horsepower at 2400 r.p.m.

The weight with cast iron cylinders was 1000 lb., which of course amounts to 3½ lb. per horsepower, which weight could, with steel cylinders, have been very considerably reduced.

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Chromium Steel for Permanent Magnets

A GOOD deal of research work on magnet steels has been conducted at the Reichsanstalt during the war; only part of it has, so far, been published in the *Wissenschaftliche Abhandlungen.* One of the points investigated is the substitution of chromium steel for tungsten steel. Bar magnets of chromium steel, stored for a year without being exposed to any disturbance, kept their magnetic moment constant within 0.3 per cent and less; in all the cases the changes observed were within the limits of the experimental error in the second half of the year. As regards constancy to heat variations and concussions and temperature coefficient the chromium steel proved equal to tungsten steel; in coercive force and remanence the best chromium steel did not come up to the best tungsten steel. The temperature coefficient of the magnetic moment diminishes with increasing content of dissolved carbon and was found to be zero in a 1.4 per cent carbon steel. To investigate the suitable ratio of length to diameter in the case of bar magnets a chromium steel originally 22 cm. in length and 0.6 cm. in diameter was gradually shortened to a length of 2.4 cm.: this shortening raised the temperature coefficient from 2.4 per cent up to 4.2 per cent. The ratio of length to diameter l/d was also found not to be without influence on magnetometer determination of the coercive force. When the value of l/d fell below 10, these determinations gave too low values; practically this point is not important.

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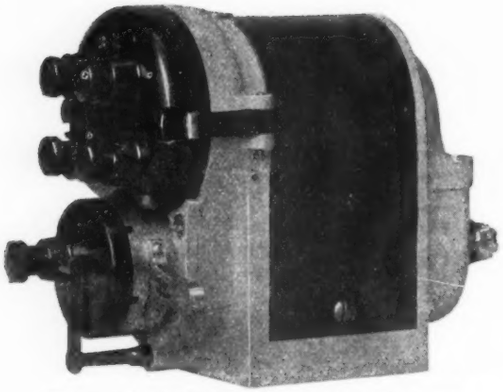
Benzol as a Motor Fuel

NOW that war demands have ceased, says the *American Gas Engineering Journal,* the producers of benzol are hoping to put a large proportion of their output on the market as motor fuel. The defects of benzol for that use, which defects need no longer exist, are of four kinds: (1) The valves and valve-stems of the engine become coated with a gummy substance which causes them to stick in the guides; (2) the valve faces become in time deeply corroded and pitted; (3) in cold weather the benzol may become frozen, and (4) the benzol contains water, which collects in drops, and finds its way into the carbureter, where it prevents a free flow of the fuel to the jet. The causes of these troublesome circumstances are now well known to benzol producers, and they may be easily removed. The gummy deposit is due to insufficient washing with strong sulphuric acid. Pitting of the valve-seats results from using benzol which contains an excessive amount of sulphur. Freezing is due to the presence of too high a proportion of benzine. Water is usually found in benzol which has not been sufficiently matured. The water, always present in the distillate, takes some time to settle out. The benzol should therefore be left to stand several days in the storage tank before being transferred to drums. To run off the water, all storage tanks should be fitted with drain-cocks at their lowest point. Attention to these matters will insure a good motor fuel. When filling drums and tins, all benzol should be run through a fine gauze. It has been proved that bulk for bulk benzol gives more power, and therefore greater mileage than gasoline.



Kliesrath model K-4 magneto. Base and end plates are a single casting

Kliesrath Magnetos

Made in 1, 2, 4 and 6-Cylinder Models by the Simms Magneto Co.—Of Water-Proof Construction and Provided with High Speed Interrupters

THE Simms Magneto Co., East Orange, N. J., is continuing some of its earlier models, the 4 and 6 cylinder open type, and in addition has recently brought out several new models, from designs by V. W. Kliesrath, who for many years was chief engineer of the Bosch Magneto Co. When Mr. Kliesrath joined the Simms company, the first work he did was to design 4 and 6 cylinder water-proof models, known as models K-4 and K-6, which have end plates conforming to the shape of the horse-shoe magnets, with grooves running around the edges which are packed with felt soaked in grease. Another improvement introduced by Kliesrath was to provide the interrupter with a rubber bumper to make its operation at high speed more nearly positive. The interrupter arm is held against the cam by a spring, and at high speed, when the cam strikes the arm a severe blow, there is a tendency for the arm to be thrown from the cam, and for contact between the points to become unreliable. The rubber bumper limits the distance the points can separate, and, therefore, enables the interrupter to work reliably at higher speeds.

Mr. Kliesrath also developed 8, 12 and 16 cylinder aircraft magnetos, all structural parts of which are made of aluminum. Tie rods are used for holding the end plates to the magnets, this construction being more secure than the use of screws. Small single cylinder and two cylinder magnetos have also been developed for use on stationary, marine and tractor engines.

The new Kliesrath 4 and 6 cylinder types have straight lines, and are of compact design. They have been designed throughout with a view of allowing manufacture of a high-grade instrument, at less cost than has been possible heretofore. Special attention has been given to a proper balance between the amount of magnetic and conducting material in the armature, the object being to obtain greater output from an instrument of a given weight. The distributer gear is made from a material manufactured by a new process, and meshes with a composition noiseless gear on the armature shaft. This material has a great tensile strength, and is particularly adapted to withstand the abuse which is unavoidable with an impulse starter. Large Norma ball bearings are used at both ends of the armature, while the distributer shaft is mounted in a plain bearing, lined with frictionless metal. The gear teeth are so designed as to withstand the excess load due to the recoil on the impulse starter. The characteristics of this instrument are such as to make it possible to obtain a full strength spark at 34 r.p.m. with the timing lever set in the most advantageous position, and at 85 r.p.m. when set at full retard. An ample timing range (35 deg.) is provided.

The Simms company also has recently placed on the market an automatic impulse starter, the main feature of which is that it goes into the same space ordinarily occupied by the magneto coupling. This enables manufacturers to provide for an impulse starter without making a change in their designs. This starter is fully automatic and requires no attention from the operator. It is completely protected from dust, and does not have to be oiled. The design is such that it can be said to cut in and out automatically, at any speed desired, by the manufacturer. It is self-contained, and is mounted as a unit on any standard type of Simms magneto.

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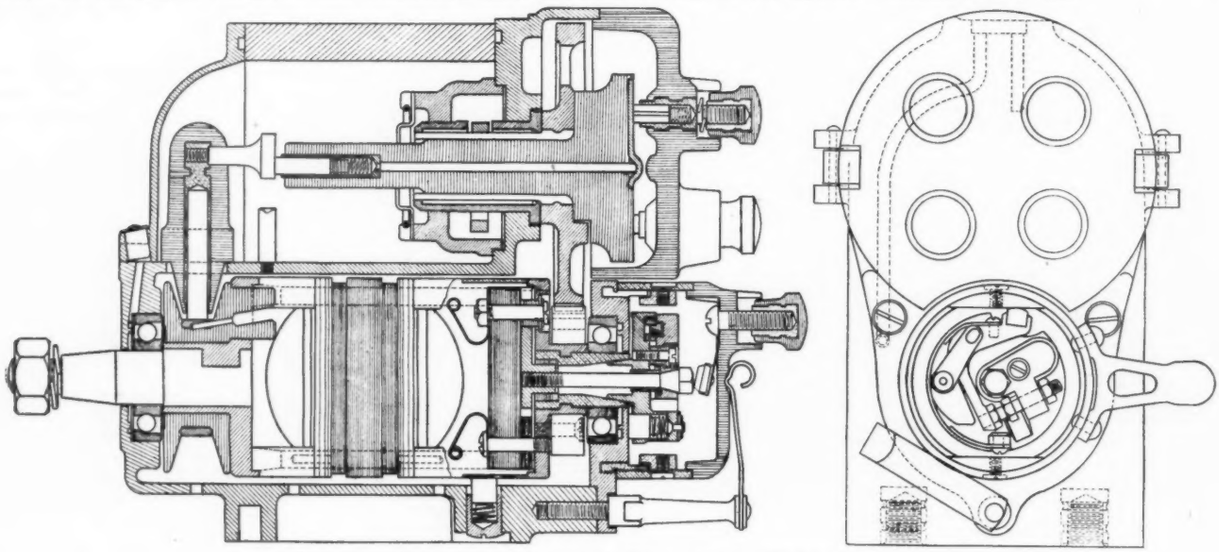
Editor AUTOMOTIVE INDUSTRIES—I note that the tables of airplane radiator performance, from my paper on this subject, which were reprinted in the March 13 issue of AUTOMOTIVE INDUSTRIES have been copied from the advance copy of the paper gotten out by the S. A. E.

As the printers of this advance copy added two and three zeros to my original figures I would appreciate it if you would insert a small note in some coming issue to warn designers that the accuracy is not carried to the extent implied by some of the figures.—ARCHIBALD BLACK.



Cross section and end view of Kliesrath 4-cylinder magneto

F-5-L Navy Flying Boat

Details of the Hull Construction—Design and Materials of Various Fittings—Panel and Strut Layout

By S. T. Williams
Assistant Chief Engineer, Naval Aircraft Factory, Philadelphia

Part II

IN the previous issue the general description, construction and performance of the model F-5-L Navy flying boat was described. It was shown, briefly, to be a twin Liberty motored biplane, having a wing span of approximately 104 ft., mounted on a hull or boat, permitting it to ascend or light upon the water. The general features of the plane were mentioned—namely, the fine streamline form of the hull, design permitting speedy production under war conditions, and the extensive use of veneer and laminated construction. The major details of this construction exclusive of the powerplant and controls will now be described.

Considering first the hull, either of two general statements are true—it may be termed a speed boat to which wings are attached, or it may be described as a standard airplane fuselage to which a V-bottomed substructure has been added in the place of the land plane's undercarriage and wheels. In either case, it serves the dual duty of carrying the crew, gasoline, etc., and as a landing device.

Hull Has Planked V-Bottom

The hull is built up around four longerons, as is a land plane, and has in addition a keel and a planked V-bottom that is flared out to present more landing surface. The flared out portions are called fins, and in this plane are an integral part of the hull structure, and are continued aft, and streamline into the hull sides. This is not the case in many previous seaplanes, namely, the H-12 and the HS-1 and 2, where the fins are stopped abruptly about one-third the hull length aft from the bow, and the advantage is increased strength and better streamline form.

Before entering into a detailed description of the hull construction, it may be well to define some of the terms used. The following defines them roughly and is the order in which they enter into the hull construction:

Keelson—A wide thin plank extending from near the bow to the stern, above the keel.

Keel—The bottom-most longitudinal member forming the backbone of the hull.

Floor Frames—The transverse planks jointed at right angles to the keelson.

Longerons—All longitudinal members extending from the bow to the stern with the exception of the keel.

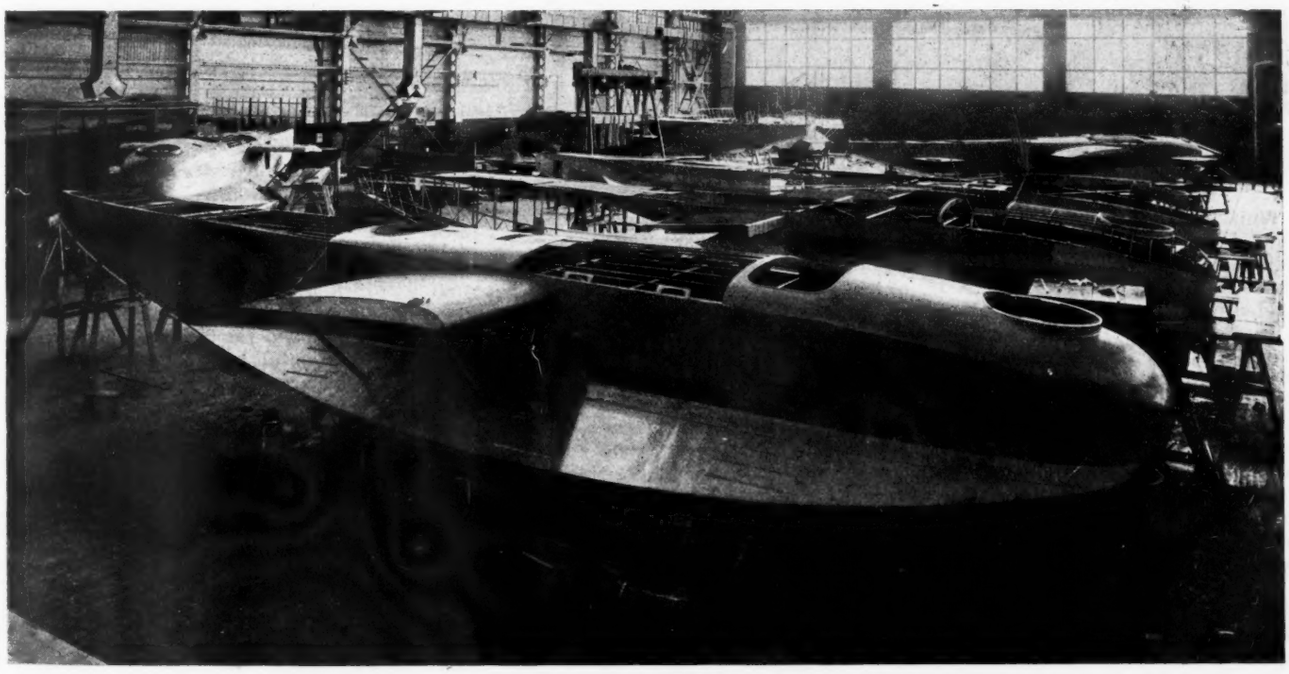
Fin Edges—The two outside longitudinals of the fins.

Stringers—The longitudinal strips connecting the floor frames on the bottom and the strips on the fins.

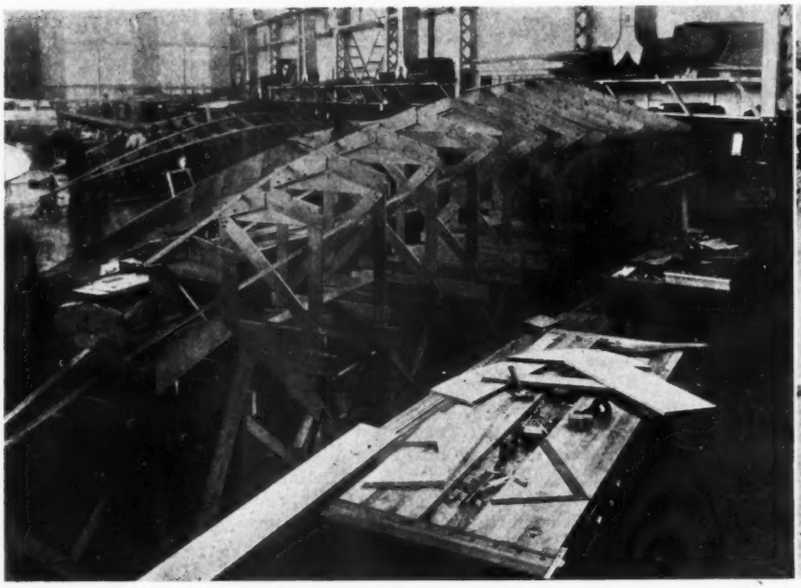
Bulkheads—All transverse veneer structures dividing the hull framing.

Transverse Bracing—The central structure connecting the hull to the two wing beams extending through the hull.

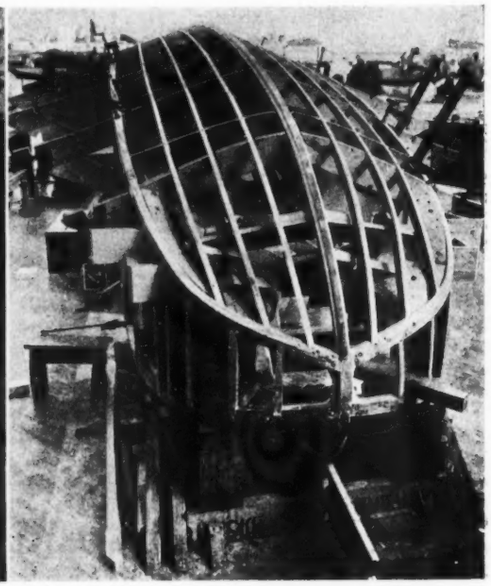
The keelsons are ½ in. basswood, built in not more than 5 sections, having at least a 9 in. scarf at the joints and held together with copper rivets. To this the floor frames, also ½ in. basswood, are notched and securely riveted by two corner stringers. Throughout it will be noted that built up members are used, permitting the use of readily available material.



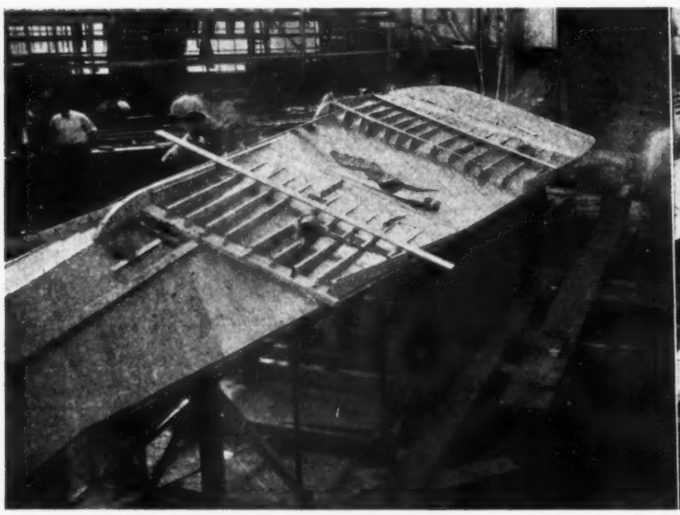
Complete hull assembly for the F-5-L Navy flying boat. This is a twin Liberty-engined tractor biplane and the hull measures 45 ft. in length and 10 ft. wide. The total flying weight of the boat is 7 tons



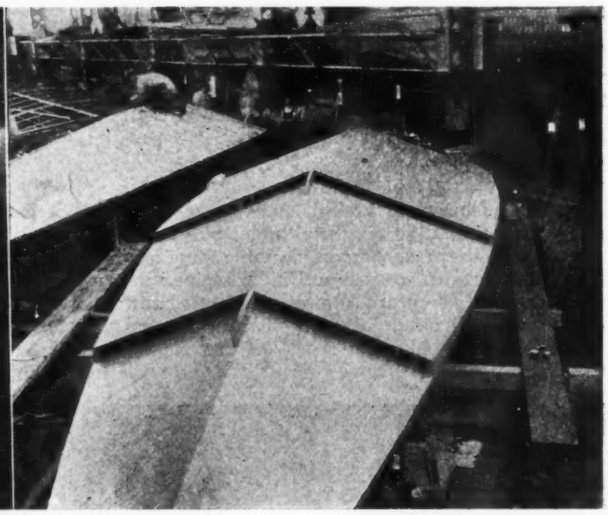
Building up the hull of the F-5-L flying boat, showing the frames in places ready for keel and stringers



Front view of the boat hull frame somewhat further along in construction



Three-quarter aft side view of the under side of the hull, showing the method of building up the steps



The hull bottom completed, showing the two steps, their location and depth as compared with the width

White ash is used for keel, longerons, fin edges, and the bent ends of the stringers. These two may be built up or spliced, but not more than four sections may be used. The scarfs in the keel must be at least 18 in. long, and are copper riveted. Formerly a straight scarf was used, as it was considered a better production proposition, but now a stepped scarf is used, as it was found that the time saved in making the straight scarf was lost in assembly.

Similar methods of splicing are used in the case of the longerons, fin edges and stringers, and here the joints are served and doped. Care is taken in the location of all splices in longitudinal members, so that a number of splices will not occur in any one section, causing a weak section and failure. For example, not more than two longeron splices may appear in any one bay, and these must both appear in either the upper pair—to balance each other.

By this method of splicing ash longitudinals, and the careful location of joints, short lengths of ash can be used. And this is important, as airplane ash under any condition is not easy to secure.

All ash members are steam bent to assembly shape before assembly on the hull forms. This bending and the splicing of the complete longitudinals are done in a separate part of the shops. Likewise the keelsons and floor frames, stringers, bulkheads, posts, struts, braces, etc., are sub-assembled, and when delivered to the hull erection floor are ready for assembly but with little fitting. This idea is carried out even to the bottom planking, which is delivered in amounts sufficient for one hull. But a detailed description of this sub-assembly construction is too involved for comment here.

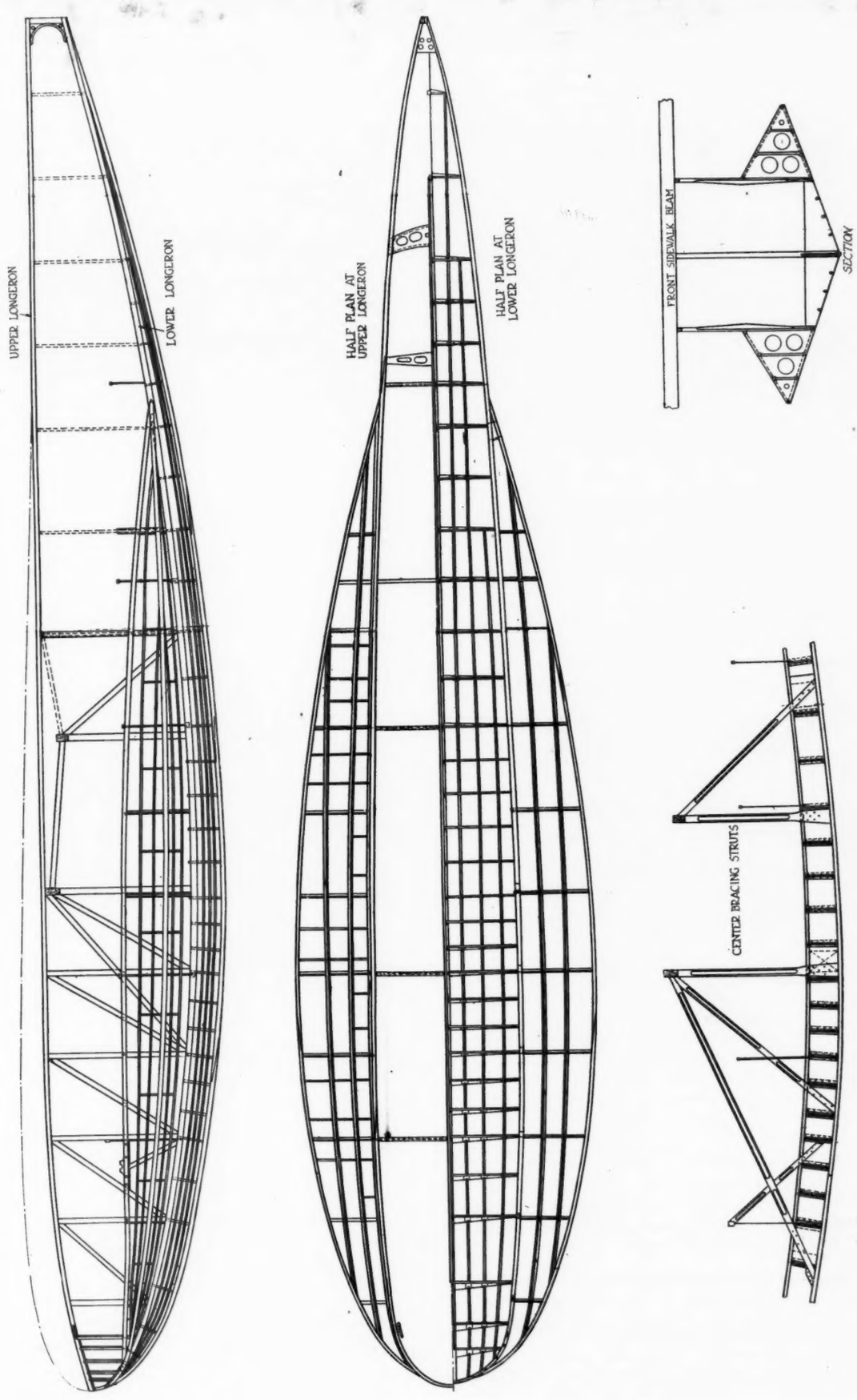
Throughout the hull construction all parts are tied together by metal fittings—and concerning these metal fittings three points are noteworthy as aiding increased production. The first is a choice of material used. One generally considers the steel entering into airplane construction as being the best possible, and heat treated to the greatest strength. But fittings on this plane are in general soft or mild carbon steel.

The reasons for this are that such steel can be procured almost anywhere, is easily worked and welded—and loses little of its strength through abuse in brazing, welding or forming. Its analysis (sheet steel only) follows:

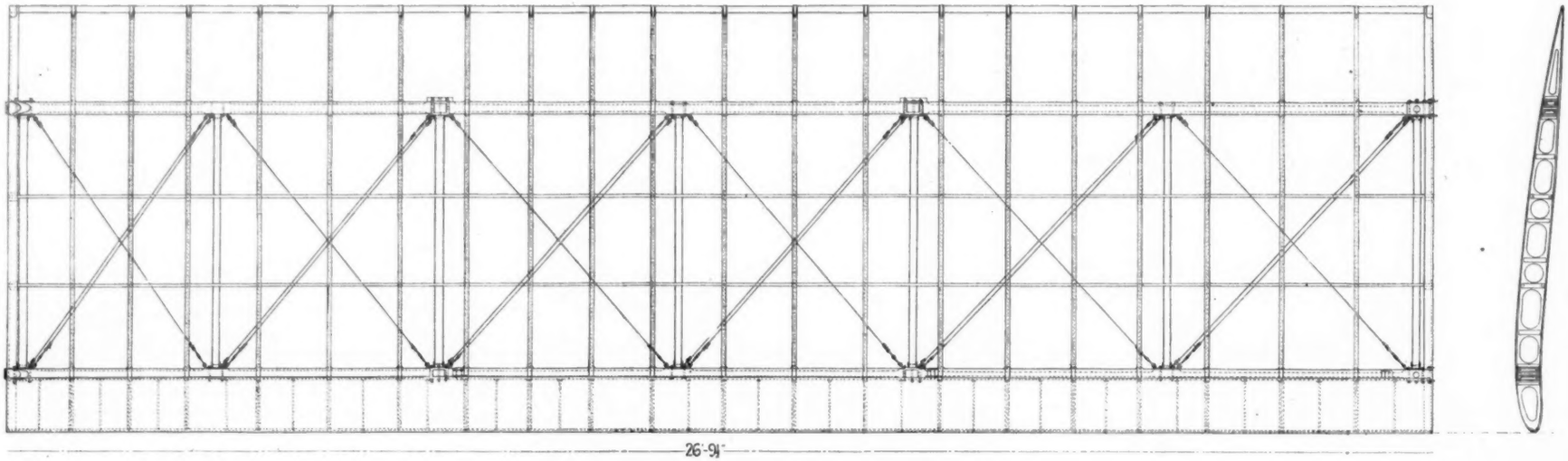
Number	Carbon	Manganese	Phosphorous	Sulphur
1020	.15....25	.30....60	.045 max.	.050 max.
1025	.20....30	.50....80	.045 max.	.050 max.

The second point to be noted in the fittings is that, with few exceptions, they are built up from flat patterns bent and brazed or welded. This eliminates drop forgings, which were

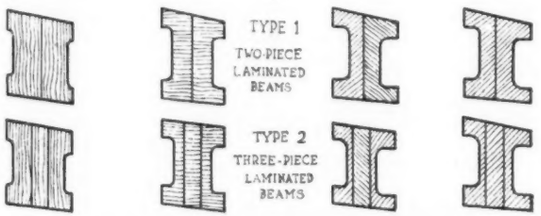
Hull Construction Plans of the F-5-L Navy Flying Boat



Wiring Diagram and Strut Sections of F-5-L Flying Boat

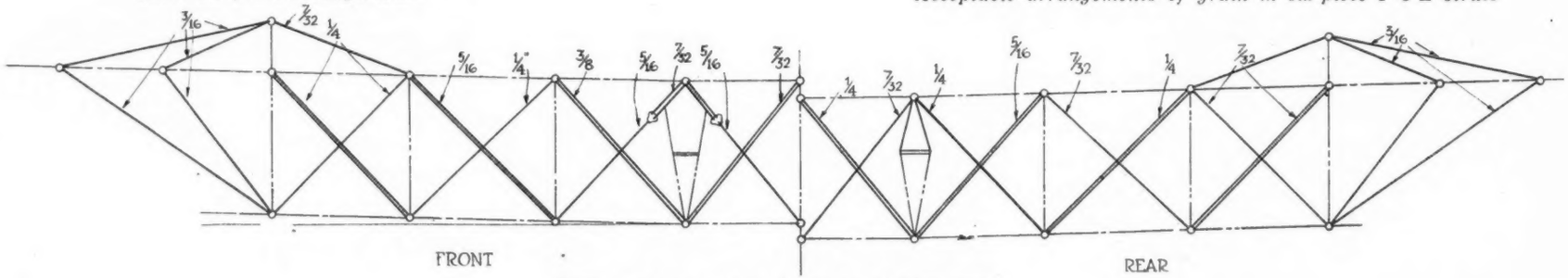


Wiring diagram of intermediate panel of the left wing



Wing beam laminations, showing only allowable grain arrangements

Acceptable arrangements of grain in six-piece F-5-L struts



Front and rear wiring diagrams of wing panel

so difficult to secure, and permitted production to go ahead without waiting on the construction of dies.

In fact many planes were built before it was possible to get dies made for punching out the flat patterns—these being sawed, ground, profiled and finish-filed to shape by hand. Hand labor was expensive, but waiting on equipment was more so, and the construction of the fittings is such that hand labor was placed to the best advantage.

The third feature of the fittings is the use of identical fittings in many places. For example, throughout the hull, the junction of the posts and the longerons; the point of attachment of the floor frames to the longerons, and the plates covering the joints of the hull bracing—fittings differed only slightly at the different stations.

However, originally each similar fitting differed slightly, necessitating a separate template, a separate print, part number, operations, etc., throughout the whole construction. But a study was made and an "average fitting" made that would suffice for several similar stations. The fact that such fittings did not exactly fit anywhere, or had lugs that were not needed other places, amounted to less than they saved time in production. And they were structually as good.

Ash Tie Strips Displace Riblets

A further difference in the construction of this hull and that of similar hulls of its predecessors is to be noted. On previous models, riblets were used to connect the keel with the fin edge stringers. These riblets were about ½ x ½ in. ash, spaced at distances varying from 9 to 15 in. transversely across the boat bottom. To bring their bottom surface flush with the stringers, lower longerons and fin edges, it was necessary to notch keel, stringers, longerons and fin edges that they might be set in. And it was a slow tedious job.

On this unit, the riblets are omitted, though several ash tie strips are used to connect the keel with the fin edges. It is considered that these, together with the planking, provide transverse strength in abundance.

Another feature in the construction is the extensive use of steel tubing as struts and posts in the body bracing. This is particularly noticeable in the tail, where the parts are under no great strain, and are not used for the attachment of other parts. Steel tubing is readily procured, and ready for use by simply cutting to length.

The central or transversal bracing unit is a complete unit in itself, and is set up as a separate assembly previous to installation in the hull. This differs from the usual construction and permits the use of templates to assure accuracy.

The transverse bracing connects the hull to the wings and the hull may be said to be built around this unit. By making all transverse bracings identical, any set of F-5-L wings, engine mountings, etc., may be more readily installed.

It is also to be noted that the wing beams passing through the hull are spliced at the center. These beams, styled the sidewalk beams, as they carry a short veneer covered wing section at each side of the hull that is used as a sidewalk for the mechanics to reach the engine, may be removed when the hull is packed for shipment. This permits the use of a much smaller shipping crate, permitting the shipment of more planes, and the use of less material in crate construction.

The bottom planking comprises an inner and an outer skin, each of 7/32 in. cedar. The inner skin is placed at right angles to the keel, differing from usual practice wherein both layers are at an acute angle to the keel. As riblets are eliminated, the right angled inner planking tends to replace them as strength members. This inner planking is either Port Oxford or Spanish cedar in random widths of from 4 to 10 in.

The outer planking is placed at an angle of 45 deg. to the keel, the acute angle being on the aft side. All pieces are from 4 to 5 in. wide, Spanish cedar, and are screwed to all longitudinals. The two layers of planking are secured together by brass clinch nails.

Courtrai, a special fabric, is laid in marine glue between the two layers of planking, and is used extensively in rendering all joints tight. All planking is laid with a slight clearance to allow a go-and-come resulting from moisture changes.

The bottom steps are secured in place after the hull is planked. They are two layers of 7/32 in. mahogany planking, fabric and marine glue between, screwed and clinch nailed together, and secured to the hull bottom by copper rivets, being separated from it by triangular ash strips. The forward ends of these steps is scarfed and set into the hull planking, a thick brass strip being set in flush over the joint.

Veneer is used extensively throughout the balance of the hull covering. This comprises the top fin edge planking, the nose planking, and the side planking. Formerly the side of the hull aft of amidships was covered with linen, taped, doped, and painted, with the exception of a narrow washboard. But in severe service, the linen covering proved too weak, and ⅛ in. 3-ply waterproof veneer is now used.

An extended technical description of the panel, strut and tail construction could be expanded to many volumes. But the outstanding features of these are laminated beams, simple strap type wing and strut fittings and laminated uniform section struts.

At one time laminated or spliced beams were not in favor but the shortage of long spruce necessitated the use of laminated and spliced beams. And it is found that the laminated beam is better than the unlaminated one. Outside of the economy of material, the ease of drying pieces of small cross section and the resulting dependability of built up beams more than offsets any additional expense in manufacturing.

Two types of laminated beams are used—the two-piece and the three-piece. The former is simply two pieces placed back to back, and glued together. The two halves are of equal thickness, and are lightened as was the solid beam except at splice positions. Scarfed splices are used, and staggered in the two halves. The two-piece beam may be used anywhere, and must be used in the following places: All front beams (except engine section), horizontal stabilizer beams, and rear aileron beams.

The three-piece beam comprises a thin piece sandwiched between two thicker outside pieces, glued together, and lightened similar to the solid beam, except at splices. This construction is used in the sidewalk and engine section, or for rear beams. Of the two types, the two-piece is considered stronger, and hence the above distinction of their use.

The idea of using strap fittings and the elimination of forgings and machined fittings extends to the strut and wing fittings. Here also mild carbon steel is used, cut from flat patterns and bent to shape.

Details of the Fittings

The base wing fitting is a U-strap, bent around and bolted to the beam. From it lugs are bent for interwing wiring, and the interplane side has a cloverleaf extension for the attachment of the struts and wire terminals. These are reinforced by washer plates to provide bearing for the bolts.

Roughly, the beams are secured to the strut ends by a bolt passing through the central cloverleaf and the strut end, and the usual strut socket is eliminated. In detail, the strut end is squared down, drilled to mate with the central cloverleaf hole, and a steel tube fitted in the end to give greater bearing and prevent the strut end from being crushed when the throughbolt is tightened.

The throughbolt has a standard eye head, permitting the attachment for the drift and anti-drift wires, where a single wire is used. When double drift wires are used, the throughbolts holding the flying and landing wire clevises are made with an eye. Bearing for the strut ends on the beam is secured by means of a thin bearing plate between the strut and the beam.

It was observed that considerable time was lost in shaping the tapered streamline section struts, and furthermore, these being in two-piece construction, required thick material that was difficult to obtain. Hence, a three-piece uniform section strut was chosen.

As stated, this strut is three-piece, and all the lightening is done in the central portion. In the rough it is a flat board, the length and width of the strut, with a series of oval holes cut out of the central portion on a vertical spindle shaper. The cheek pieces are then glued on each side, and the strut rough machine planed to a streamline section. It is then finished to the desired section by hand. *(To be continued)*

Laughlin Husky Tracklayer Type Tractor

Has Low-Speed Engine Delivering 20 Hp. on the Belt— Steered by Applying a Brake to the Driving Mechanism of One Track or the Other

Laughlin tracklayer type tractor, showing steel chain tread

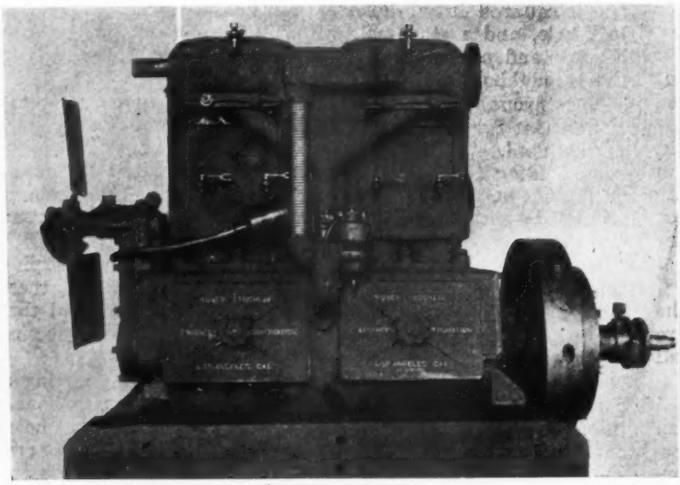
A NEW tractor for farm and orchard work has been placed on the market by the Homer Laughlin Engineers Corp., Los Angeles. It is of the creeper or tracklayer type, and one of its special features is a patented chain tread, which is made from hardened steel claimed to be tough and durable. Ten tractors equipped with this tread have been in use for over three years, and show no appreciable sign of wear, we are informed. The chain has no loose spools or pins, the principle being similar to that of a train coupling. The shoes are made of ¼-in. hot pressed plow steel, 10 in. wide, and are bolted to the track links.

The engine used on this tractor is the Laughlin heavy duty, slow speed design, of 4⅜-in. bore by 5⅛-in. stroke. It is rated to deliver 20 hp. at the belt pulley, operating at a governed speed of 700 r.p.m. The cylinders are cast in pairs, with detachable cylinder heads. The crankcase is a one-piece casting, with removable splash pans.

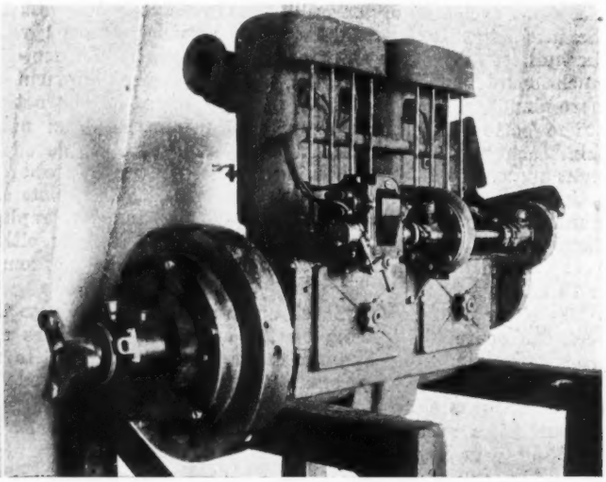
The valves are located in the cylinder head; they are drop forged from nickel steel and have a clear diameter of 2 in. The piston pin is 1 7/16 in. in diameter, hollow, hardened and ground. Its bearings measure 1 7/16 x 2¼ in. The crankshaft is supported in three bearings, of the following dimensions (front to rear): 2½ x 3¼ in., 2¼ x 3¾ in., 2¼ x 4⅞ in. The connecting rod bearings are 2¼ x 3 in.

A governor of the centrifugal type is fitted, and is entirely enclosed. It insures close regulation of engine speed. Ignition is by a Dixie high-tension magneto with impulse starter. Cooling water is circulated by a large centrifugal pump with enclosed driving gears. The radiator is of unusually large surface, and is provided with a positively driven fan.

The transmission is of the sliding gear type, and gives two forward speeds and one reverse, the two forward speeds being 1.7 and 2.7 m.p.h. respectively. All gears



Side view of engine. Note carbureter mounting on crankcase, and flexible inlet pipe



This view of the engine shows the valve rods, magneto and pump

are made of forged steel, hardened, and their shafts are mounted in ball bearings. The gear is fully enclosed and runs in a bath of oil.

Each track of the tractor is operated independently through a friction clutch. The friction clutches are of the expanding segment type and are faced with maple blocks. A clutch brake is applied automatically when the clutch is disengaged. The sprocket rims are cast in chills, which gives them a hard, long wearing surface. These sprocket wheels are demountable. There is one sprocket on each side, and they are driven by large external cut gears, fully enclosed.

The tractor has an independent track frame. The pivoting axle is located just ahead of the track sprocket. It is claimed that this new feature takes all strain off the driving gears. There are three track wheels on each side, these being mounted on Hyatt roller bearings. The track shoes are of pressed steel, 10 in. wide. The tracks have a bearing area of 12,000 sq. in., making the unit pressure 5 lb. per sq. in., as the total weight of the tractor is 6000 lb.

The power take-off pulley is located in the rear in such a way that the belt can be easily tightened.

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Searchlight Arrangement on Italian Aircraft

AN article in the *Oesterreichische Flug Zeitschrift* describes the arrangement used on Italian aircraft to illuminate the ground on starting and landing during night flying. Two kinds of power sources are used—first, an accumulator battery, seldom employed because of its high weight for the required capacity, and, secondly, a dynamo, sometimes in conjunction with a battery. The dynamo is either driven by a fan or connected direct to the engine, both having their advantages and disadvantages. The first is independent of the motor, but its efficiency is low. The second is more efficient and is the one that in future will be most employed. In both cases the revolutions per minute are not constant, and therefore the voltage alters, and, accordingly, the dynamo must be fitted with a voltage regulator. The voltage is regulated by increasing or decreasing the current in the shunt winding of the motor. The voltage of the lighting system is usually about 14 volts and current 9.1 amps (125 watts). The energy, loss, etc., in various parts of the system is discussed at some length and the efficiency for a fan-driven motor system given as 125 watts/411 watts $\times$ 100 = 30.8 per cent. The weights of the parts in this case are:

Dynamo, together with propeller and support	13.5 kg.
Light reflector and lamps, etc.	6.0 kg.
Controlling apparatus and lead	2.05 kg.
Accumulator	8.0 kg.
Total	29.55 kg.

—

Measuring Noise Electrically

A METHOD of measuring the intensity of noise, which may prove of use in demonstrating the silent operation of passenger cars is described in *Electrotechnik und Maschinenbau* for Dec. 15. According to the article, it is possible to measure the intensity of a noise by measuring the current in a circuit inductively coupled to a circuit containing a microphone exposed to the sound waves. The measuring instrument may be either an oscillograph or a baretter. Oscillograms produced in this way by an automobile and by an airplane are reproduced in the article. Small differences in the intensity of a noise are best obtained by a baretter in a bridge connection that is suggested. In other cases resonance methods are recommended. The methods should be of use in experiments with the object of reducing the noise produced by airplane engines, says the author. He thinks it should be possible to silence the engines by causing an interference to take place between the waves emitted by the different exhausts.

New Models at Lyons Fair

(*Continued from page* 683)

are carried right out to the frame members, thus avoiding the use of an underpan, and the oil pump, driven off the camshaft can be withdrawn complete with its gears, its shaft, housing and pinion, these forming one unit.

With this general arrangement everything is getatable. There is nothing whatever in front of the valve stems. The magneto contact breaker and distributer are facing outwards. The electric generator and starting motor are slightly above the top of the side frame members and there is nothing to interfere with the accessibility of the carbureters.

A three-stage aluminum crankcase has been adopted; the upper portion, which is bolted to the frame members at four points, receives the cylinder casting, the central portion is a girder construction receiving the bolts for the main bearings, and the lower part is merely an oil pan having a filter along its whole length and receiving the oil pump.

The crankshaft 2 in. in diameter is carried in four plain bearings. It is machined all over, balanced by three counter weights, and is drilled for forced-feed lubrication.

The connecting-rods are I-section machined all over, attached to the crank pins by four bolts each, and to the forged steel pistons by means of a hollow wrist pin, which is locked in the piston bosses in a manner shown in the illustration. There are three compression rings of the stepped type.

The camshaft and accessories are driven by two silent chains.

The design of the exhaust manifold reveals racing experience. This organ is in two parts to allow for uneven expansion; it broadens as it nears the rear and is divided down the center so that the exhaust from the forward cylinders will not meet those of the rear and cause back pressure. The exhaust ports are big and so shaped as to liberate the gases with the least amount of friction. The entire arrangement gives the free release of the gases as effectively as with separate exhaust pipes, while having the advantage of a neat single organ which does not interfere with the accessibility of the valve stems.

Bolted up to the engine base chamber is another housing containing the dry-disk clutch, alternative plates of which are lined with ferodo fabric.

There are four forward speeds and reverse, and the whole of the pedals and control levers are mounted on the gearbox casting independently of the frame.

Delage has always been a partisan of Hotchkiss drive and has maintained it in this model, with of course, a universal joint at each end of the propeller shaft. Rear axle is full floating type, with a wealth of ball bearings both for the driving couple and for the differential shafts. As the drawings show, the driving pinion shaft is carried in double radial and double thrust ball bearings at its forward end, and in double radial bearings at its rear end. The differential shafts at their inner ends are carried in big radial and thrust bearings and at the outer ends there are big diameter radial bearings well spaced so that all the load is carried between the two bearings. Except that final drive is by means of Gleason gears, this rear axle does not differ in any essential features of design from the special axles used on Delage racing cars.

The underslung rear springs are three-quarter elliptic type, with a width of 2½ in. and a length for the main leaf of 51 in.

The front axle is also the outcome of racing experience. The steering knuckles are castor type, the pivots being so inclined that if their axis were extended it would cut the vertical axis of the wheel at the point of contact of the tire with the road. The steering pivots have double ball bearings top and bottom, as well as a thrust bearing, while the front wheels have widely spaced spherical radial bearings, with a double thrust bearing between the two.

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Training Operatives

DURING the continuance of the war the National Government was vitally interested in having every factory engaged in an essential industry, operate at the highest possible efficiency. Consequently, the U. S. Department of Labor organized a training service, the object of which was to teach factory workers the best and most productive methods of doing their particular job. It is claimed that most remarkable results were achieved in some instances. Operatives who had been doing a certain task for years in some instances, turning out a certain number of pieces per hour, by being trained to improved methods for a week, increased their production 30, 50, 70 and even 100 per cent. According to H. E. Miles, who was in charge of this work and who spoke on it at the National Conference of the Society of Industrial Engineers in New York last week, the usual method of the service consists in segregating a certain amount of equipment for training purposes and schooling operatives in improved methods. Inasmuch as the increased productivity leads to increased earnings, the operatives usually take to the plan with avidity. In cases where the operator is on piece work his earnings will increase in the same ratio as his output, while the employer will be benefited by a decrease in the overhead charges on his product.

This training service was a war activity and will be discontinued after June 30. We understand, however, that the service still has available considerable funds, which it is endeavoring to spend to the best advantage of the Nation. We believe that manufacturers in the automotive industries will be glad to take advantage of this opportunity. There is particular need for bringing our productive capacity up to the highest possible pitch in view of the approaching sharp competition in the world's markets. America pays higher wages than any other nation and in order to be able to compete in foreign markets it is necessary that its workmen should turn out more work in a day than those of other nations.

Proper training of operatives with a view to increasing their productivity, therefore, would seem to be a step in the right direction.

It will help the manufacturer in reducing his percentage of overhead, the employee in increasing his earnings and the country in meeting foreign competition in the world's export markets.

Don't Shackle Brains

TOO often a concern will search the country for the best bit of human brain power that it can secure along certain specialized lines, and then, after it has secured it, at a high price, will shackle it.

If you are sick and know how to cure yourself, you do not hire a doctor and pay him to listen to your diagnosis and method of cure.

If your business is sick or failing in a certain department and you secure the best man in that line to head that department, you must remember that you have not paid him to listen and to put into effect YOUR method of running that end of the business.

You had your chance before you called the specialist in. You needed him or else you would not have called him in. After you have got him, do not hog-tie his mentality and experience. Give him free rein. He has a reputation to make and support and he is going to do that by building up YOUR business in his particular department.

When you fail to allow your specialist to use his knowledge, when you make him subject to another who could not hold down his job before the specialist came, you are in a worse position than you were before, because you have secured little or no improvement and have the added expense of your new man. You have probably added the damaging feature of internal friction to your organization, and this is costly.

It pays to hire the best men you can get. They are your tools and the quality of work is closely governed by the quality of the tools that produce it.

After you have gotten your men, let them use the qualities which led you to employ them.

Imaginary Spring Wheel Losses

IN spite of the many agencies at work spreading enlightenment on mechanical matters, certain fallacies seem to have a very deep-rooted hold on the public mind. One of these is that a spring wheel in which the spokes are free to expand and contract lengthwise, and in which when the load is applied the axle is eccentric to the rim or tire, is hard rolling, producing the same effect on the level as when a vehicle with rigid wheels is ascending an endless hill. The supposition is that the spring wheel will be similar in its action to a rigid eccentric wheel when it is attempted to move the wheel out of the position in which it will naturally come to rest on account of its eccentricity.

Now, the spring wheel and other elastic wheels have proven a rather mediocre success, and undoubtedly as at present constructed they possess many defects, but that of a continued serious loss due to the eccentricity of the wheel is not one of them.

As one contractible spoke after another nears the lowest position, it is, of course, compressed by the load, and a certain amount of energy is stored up in it. As it is the forward motion of the wheel that causes this energy to be stored up, it is supposed that this energy has to be supplied either directly by the engine or from the kinetic energy of the vehicle, which would justify considering these spring spokes a drag on the vehicle. However, as soon as the spokes pass the lowest position they expand again, the energy stored up in them is released and is expended in moving the vehicle ahead. The effect is the same as when a rigid eccentric wheel seeks its natural position of rest. The energy thus gained is equal to the energy previously lost in compressing the springs.

Another way of looking at the matter is as follows: The amount of energy stored up in the spring spokes of the wheel always remains the same, as the compression and extension of springs goes on simultaneously and always at the same rate. There is therefore no need for drawing energy from an outside source. The only possible loss would be that attending the compression of springs. Steel, if worked within the elastic limit, is an almost perfectly elastic medium, and whatever molecular friction there may be is negligible from a practical point.

Motion Picture Commercial Propaganda

THE plan of the Department of Commerce to exhibit motion pictures of American industries abroad is an excellent one and should receive the co-operation of every manufacturer with foreign commerce ambitions. Great Britain and Germany have both realized the value of the motion picture abroad, and the time is ripe now for American manufacturers to immediately adopt similar methods. Before the war the Germans were commercially well established in Japan, due chiefly to the display of motion pictures of their industries, while no propaganda was made for the United States, and American trade suffered accordingly.

Reports from abroad indicate a keen interest in industrial pictures and state that films devoted especially to road construction and the manufacture and uses of automotive products will be welcomed. In fact, when the American Association of China recently displayed industrial films in Shanghai the theater was filled to overflowing despite unfavorable weather. Possibly the National Automobile Chamber of Commerce, acting for the majority of the manufacturers, can take this matter up directly with its members and act as the medium for securing motion-picture films for the Bureau of Foreign and Domestic Commerce.

Pressed Steel in Trucks and Tractors

IN passenger car manufacture pressed steel parts now occupy an important place. Frames, rear axles, tanks, mufflers, oil pans and many other parts are very generally made of this material, and the application of pressings is constantly gaining ground. The chief advantage of pressings is that they permit of lighter construction than parts made by other methods at equally low cost. It has therefore been a question whether in other branches of the automotive industry, where low weight is not such an urgent requirement as in trucks and tractors, there would be a field for pressed steel parts. It will be remembered that it took a very long period before the pressed steel frame obtained a firm footing in truck construction. Structural steel was said to be much better, possessing greater ultimate strength, partly owing to a higher carbon content and partly to the improvement of the molecular structure by the rolling operation. However, to-day the pressed steel frame is firmly established in the truck field, and it is even being used on tractors. Probably the next step will be the production of pressed steel axles for trucks. At the present time most truck axle housings are made of cast steel. If pressed steel is superior to cast steel for passenger car axles, why is it not superior for truck axles also? The only possible reason that occurs to us is that the thickness of metal required in the former is below that which can be successfully cast in steel, while that required in the latter is not. It does not require much foresight, however, to predict that the problem of pressed steel truck axles will be attacked and successfully solved, not only technically, but commercially as well.

Latest News of the

3227 De Haviland 4's Produced

457 in Front Lines on Day of Armistice — Cancellations of $480,000,000 to March 19

WASHINGTON, March 25—Up to the signing of the armistice 3227 De Haviland 4 planes were produced, of which number 628 were in actual service at the front, 1885 floated for delivery to the A. E. F., and 1025 assembled over seas for service. Four hundred and fifty-seven were in actual front line duty on the day the armistice was signed.

Aircraft contract cancellations up to March 19, 1919, exceeded $480,000,000, of which 52 per cent were for engines and spare parts and 35 per cent for airplanes and spare planes, the balance being for accessories, balloons and supplies.

Following is the tabulation showing the number of De Haviland planes produced and in service, and the various values of contracts canceled and suspended.

	Number	Per Cent of Total Production
Produced	3,227	100
Floated	1,885	58
Received at French ports*	1,185	37
Assembled overseas	1,025	32
Put into service overseas	984	30
Put into service at front	628	19
In commission at front†	457	14

*To Nov. 1, 1918.
†To Nov. 3, 1918.

VALUE OF CONTRACTS CANCELED AND SUSPENDED TO MARCH 19

	Value	Per Cent of Total
Engines and spare parts	$250,409,982	52
Airplanes and spare parts	167,554,386	35
Chemicals and chemical plants	19,852,370	4
Instruments and accessories	13,832,902	3
Balloons and supplies	10,071,035	2
Fabrics, lumber and metals	7,968,324	2
Miscellaneous	11,041,132	2
Total	$480,730,131	

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Oil Exports Decrease

WASHINGTON, March 26—The effect of the armistice on oil exports is readily displayed by the export figures for February, 1919. Gasoline exports total 26,964,764 gal. in February, 1919, as compared with 35,396,038 gal. in the same month of 1918. Kerosene and lubricating oils increased in February, 1919. Mineral oil exports for February, 1919, total 165,889,425, as compared with 221,579,890 gal., worth $24,031,982, which were exported in February, 1918. The greatest decrease, as compared with 1918, is noticeable in the exports of fuel oil, which decreased from 118,863,438 gal. in February, 1918, to 36,710,850 gal. in February, 1919.

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Will Sell Copper for War Department

WASHINGTON, March 26—The United Metal Selling Co., representing the copper producers, has arranged with the War Department to sell 100,000,000 lb. of copper belonging to the department, and also whatever copper scraps the army has to dispose of. Not less than 5,000,000 lb. of copper will be delivered by the Government to the copper producers each month for a period of 10 months, and then 10,000,000 lb. per month will be delivered for a period of 5 months.

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No Action on Saxon Plan

NEW YORK, March 27—A meeting of stockholders of the Saxon Motor Car Corp. was held yesterday to vote upon a proposed re-organization plan prepared by the creditors. Inasmuch as only 6000 shares of the total of 60,000 shares outstanding were represented, no formal action was taken.

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New British Commercial Organization

WASHINGTON, March 26—British Manufacturers' Association has organized a Federation of British Industries numbering 16,000 firms which will cooperate with its members on foreign trade. The organization will appoint overseas trade commissioners. A beginning has been made in Spain. These commissioners are to be men of commercial qualifications, conversant with the customs and commercial needs of the countries to which they are appointed.

233,881 War Motor Vehicles Ordered

90 Per Cent Delivered to Government Included 96,551 Trucks and 20,037 Cars

WASHINGTON, March 24—Ninety-six thousand, five hundred and fifty-one motor trucks were delivered to the United States Army up to Feb. 1, 1919, according to figures made public to-day by the War Department. Of this number 51,784 were shipped to France and 44,767 have been distributed in the United States.

Included in the total number delivered were 37,891 class B 3-ton standardized trucks, 15,084 Class A 1½-ton trucks and 24,095 four-wheel drive trucks. Eleven thousand B trucks remained on order, of which number all but 7348 have been canceled. In addition 5137 four-wheel drive, 3772 Class AA ¾-ton and 2329 Class A 1½-ton trucks still remain on order.

Highest per Cent of Cars Delivered

In all there were 233,881 trucks, passenger cars, ambulances, motorcycles, trailers and bicycles ordered by the Government, of which 90 per cent were delivered, the highest delivery per cent being that of passenger cars, of which 20,038 were ordered and 20,037 were delivered. Fifty-six per cent of the 37,891 B trucks delivered were shipped to France.

Following is the complete tabulation showing the status of motor vehicle contracts delivered up to Feb. 1, 1919:

MOTOR VEHICLES DELIVERED AND REMAINING ON ORDER
FEBRUARY 1, 1919

Type	Total Orders Less Cancellations	Delivered	Remaining on Order	Per Cent of Ordered: Delivered	Per Cent of Ordered: Remaining
Trucks					
Light delivery and repair	13,209	13,209	0	100	..
"A" 1½ to 3-ton	17,413	15,084	2,329	87	13
"B" 3 to 5-ton	45,239	37,891	7,348	84	16
"T" F. W. D. 2 to 3-ton	29,232	24,095	5,137	82	18
"AA" ¾ to 1-ton	10,044	6,272	3,772	62	38
Motor cars	20,038	20,037	1	100	..
Ambulances	14,073	13,321	752	95	5
Motorcycles	39,239	36,832	2,407	94	6
Trailers	27,223*	23,913	3,310	88	12
Bicycles	38,917	33,217	5,700	85	15

*Not including 4847 Ordnance Department trailers.

DISTRIBUTION OF VEHICLES DELIVERED

Type	Overseas	In U. S.	Per Cent of Total Delivered: Overseas	Per Cent of Total Delivered: In U. S.
Trucks				
Light delivery and repair	10,849	2,360	82	18
"B" 3 to 5-ton	21,388	16,503	56	44
"T" F. W. D. 2 to 3-ton	11,782	12,313	49	51
"A" 1½ to 3-ton	6,235	8,849	41	59
"AA" ¾ to 1-ton	1,530	4,742	24	76
Bicycles	28,419	4,798	86	14
Ambulances	8,633	4,688	65	35
Motorcycles	22,133	14,699	20	40
Motor cars	9,193	10,844	46	54
Trailers	5,949	17,964	25	75

Automotive Industries

Steel and Iron Prices Reduced

Expected to Stimulate Buying—Pig Iron Reduced $4.25, Billets $5 and Rails $10 a Ton

NEW YORK, March 21—Basic prices of iron and steel have been reduced considerably below previous current prices, though the reduction is not as great as was expected in some quarters. The reductions range from $4.25 per ton on pig iron and $5 on billets to $10 on standard rails; they amount to $7 per net ton on plates, shapes, bars, wrought pipe, sheets and tin plate, and to $5 on wire, wire nails, hoops and light rails. The new prices become effective at once and amount to 10 to 14 per cent.

It is expected that the lower prices, which are minimum, though the prices set by the War Trade Board were maximum, will stimulate buying. For the past 6 weeks the iron and steel markets have been weak due to the holding up of orders on the part of purchasers in anticipation of the reduced price. On this score *Iron Age* says:

"The opinion is general in the steel trade that the reduced prices will bring out in the near future a moderate amount of new business which buyers have held up since the stabilizing movement loomed up about 6 weeks ago.

"Willingness to co-operate with the Government to secure a stable market and the largest possible operation of iron and steel mills is shown both by producers and manufacturing consumers. It is yet to be developed how far the reductions will go in stimulating a demand over and above what has accumulated, and whether the new prices can be maintained as minimum through the year, as proposed in the Washington program."

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No Heavy Steel Buying in Detroit

DETROIT, March 27—The new steel prices have not stimulated any heavier buying by Detroit manufacturers as yet. They are still purchasing what they need, from day to day, and are awaiting further developments. They declare that steel must come down lower, but can hardly see any hope of a further reduction for some time to come. There seems to be some apprehension as to whether the new prices are in violation of the Sherman anti-trust law, and it probably will be some time before the true sentiment in and around Detroit can be gaged.

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Klingensmith on Vacation

DETROIT (Special Telegram)—March 26—F. L. Klingensmith, vice-president of the Ford Motor Co., has left Detroit to take a long vacation. It is rumored that he has either severed his connection with the company, or that he will do so shortly.

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Coffin Leaves France

PARIS, March 1—Howard E. Coffin is leaving Paris this week for New York via England. Mr. Coffin has been on this side for the past 3 months and has travelled extensively in England, France, Italy and occupied portions of German territory. Mr. Coffin has been particularly interested while in Europe in everything concerning aviation development, and particularly the role which America will play in the coming conference to decide on international agreements regarding air navigation.

It is understood that Mr. Coffin will spend but a short time in America in order to attend to his private business matters and then will return to Paris.

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Will Control Air Equipment Sales

WASHINGTON, March 25—The Salvage Branch, Supply Section, Division of Aircraft Production, has been charged with complete responsibility in all matters pertaining to the sale of surplus and obsolete air service equipment, and no sales will be made in the future until the salvage branch authorizes them.

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U. S. Chamber Aids Employment for Soldiers

WASHINGTON, March 24—The United States Chamber of Commerce is asking for the co-operation of all commercial organizations to assist in placing returning soldiers and sailors in employment. The chamber plans to establish a bureau for the purpose of expediting the co-operative work of the various organizations toward alleviating the existing employment problem.

February Exports Are Excellent

January's Figures Were Good, but They Are Surpassed by Last Month's

	Cars	Value	Trucks	Value	Parts
Feb.	3,041	$3,719,485	1,403	$4,270,542	$2,699,741
Jan.	2,137	2,916,381	907	2,375,584	2,406,783
			1918		
Feb.	3,584	3,079,191	766	1,917,638	1,962,797

WASHINGTON, March 26—In AUTOMOTIVE INDUSTRIES of March 6 it was pointed out that our automotive exports for the month of January, 1919, augured well for the future of our overseas trade. The February figures given herewith tend to confirm that prophesy—they show appreciable advances in cars, trucks and parts when compared with the totals for the previous month.

For the time being our exports to the United Kingdom are in bad shape, due, doubtless, to the embargo which is in force. It is not anticipated, however, that the present restrictions will be maintained for any considerable time, and there is ample evidence of a strong demand for American cars and trucks in Great Britain.

In view of statements made recently to the effect that Australia would give preference to automotive products of British origin it is satisfactory to observe that during February Australia was our best customer for passenger cars.

Truck exports are practically double those of January, but the distribution is far from satisfactory, in the sense that many countries capable of buying commercial vehicles from us—countries which have industries needing up-to-date road transport—are not purchasing regularly.

(*Continued on page* 716)

New Schedule of Iron and Steel Prices

	Nov. 11 Price	Present Price	New Price	Reductions From Nov. 11	Reductions From Present
Pig iron, basic	$33.00 G. T.	$30.00	$25.75	$7.25	$4.25
Billets, 4-in.	47.50 "	43.50	38.50	9.00	5.00
Billets, 2-in.	51.00 "	47.00	42.00	9.00	5.00
Sheet bars	51.00 "	47.00	42.00	9.00	5.00
Slabs	50.00 "	46.00	41.00	9.00	5.00
Skelp, sheared	3.25 cwt.	3.00	2.65	12.00 N. T.	7.00 N. T.
Skelp, universal	3.15 "	2.90	2.55	12.00 "	7.00 "
Skelp, grooved	2.90 "	2.70	2.45	9.00 "	5.00 "
Merchant bar, base	2.90 "	2.70	2.35	11.00 "	7.00 "
Sheared plates	3.25 "	3.00	2.65	12.00 "	7.00 "
Structural, base	3.00 "	2.80	2.45	11.00 "	7.00 "
Wire rod	57.00 G. T.	57.00 G. T.	52.00 G. T.	5.00 G. T.	5.00 G. T.
Plain wire	3.25 cwt.	3.25	3.00	5.00 N. T.	5.00 N. T.
Nails	3.50 "	3.50	3.25	5.00 "	5.00 "
Black sheets No. 28	5.00 "	4.70	4.35	13.00 "	7.00 "
Blue annealed No. 10	4.25 "	3.90	3.55	14.00 "	7.00 "
Galvanized sheets No. 28	6.25 "	6.05	5.70	11.00 "	7.00 "
Tin plate, 100-lb. box	7.75	7.35	7.00	15.00 "	7.00 "
Tubular products	3½ points more off card				7.00 "
Hoops—Base	3.50 cwt.	3.30	3.05	9.00 "	5.00 "
Light rails	3.00 "	2.70	2.45	11.00 "	5.00 "
Rails, standard Bessemer	55.00 G. T.	55.00 G. T.	45.00 G. T.	10.00 G. T.	10.00 G. T.
Rails, standard open hearth	57.00 "	57.00 "	47.00 "	10.00 "	10.00 "
Ore	No change				

Abbreviations: G. T., gros ston; N. T., net ton; cwt., hundred pounds.

General Motors Buys Another Plant

Takes Over Inter-State Buildings and Land—For Parts Manufacture

MUNCIE, IND., March 22—General Motors has bought the fiscal property of the Inter-State Motor Co., including the plant and 40 acres of land adjoining it. It is expected that this property will not be used for the manufacture or assembly of cars, but of parts, although the plant readily would lend itself either to the manufacture of assembly of cars or the building of bodies. However, there is no doubt that with the plant and adjoining property General Motors has acquired the nucleus of another large unit of its vast activities. This also is taken to mean that there will be no more Inter-State cars and the company automatically will cease to do business.

The Inter-State company was one of the first to discontinue the manufacture of cars for the duration of the war early in 1918. It was announced at that time that the company would place on the market 1 and 1½-ton trucks instead. However, the company took on contracts for artillery tractors and had only tooled up for production when the armistice was signed. As a result peace found it totally unprepared to resume commercial work, and it notified its distributers and dealers that they should not depend on deliveries for several months to come. It was expected then, however, that when the company had completed the 15 or 20 per cent of the Government orders, which it planned to do, and had re-converted the plant back to cars, a much improved car would be marketed.

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Germany Preparing for World Markets

WASHINGTON, March 19—German manufacturers realize and are preparing for a new and hard commercial war to follow the signing of peace, according to advices received here, and a network of organizations has been created to assist German industry. The Technikische Meese G. m. b. H. (Technical Fair) has been organized in Leipzig to promote the interests of numerous makers of tools, machinery, factory equipment, etc., and will develop German inventive genius.

The Company for Home and Foreign Undertaking, Hamburg, with a capital of $5,950,000, plans a series of measures to revive trade abroad, and especially in the Balkans, the Caucasus and Persia. The Austro-German division of this company plans to develop Turkey for German trade. Likewise the Institute of Navigation and World Business, with a membership of 4300 manufacturers, and the United League (Die vereinigten Verberde) are planning world-wide advertising and selling activities.

Technical magazines published in English and other languages are planned to stimulate foreign business, and will be especially devoted to extolling German manufacture and the low prices of German made goods.

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Sarles Wins Ascot

LOS ANGELES, CAL., March 23—If the Santa Monica Road Race a week ago and the Ascot Speedway to-day are taken as indications, racing this year will attract more persons than ever, for fully 50,000 saw Sarles take the 150 miles at better than 71 m.p.h., which was a new track record. He drove his Roamer Special and won in 2 hr., 7 min., 2 sec. Hearne in a Chevrolet won second, Pullen third in a Hudson, and Durant in a Chevrolet fourth. The fourth man finished less than a minute after the winner. Toft and Lewis were still running at the end, but Lecocq, Elliott and Thomas had been eliminated by mechanical trouble. There were no accidents.

The new track record is considered very good indeed in view of the fight Sarles had to put up. Three stops for tires delayed him as he was using retreaded tires that for a time littered the track, but he finally changed to others.

DePalma had intended to try for the track record, but in practice yesterday he damaged his steering gear so to-day he only drove a 5-mile exhibition.

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Transatlantic Flight Rumored

WASHINGTON, March 21—Many reports are current here of possible flights across the Atlantic, some to the effect that these will be tried shortly, and one that France is even now preparing to send a pilot across. Great Britain, it is reported, has a huge plane with a 375 hp. engine already at St. Johns, Newfoundland, and will make the trial to Liverpool —about 1300 miles—in the next few days. Several American pilots are said to be making tests preparatory to making the trip, and it is said that Lt.-Com. P. L. Belinger, in charge of the air station at Norfolk, will try to negotiate the long distance flight within the next 10 days in one of the big navy flying boats. There is no definite news, however, on this subject.

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Oregon to License Mechanics

SALEM, ORE., March 21—Automobile mechanics hereafter will be licensed in the State of Oregon. The State Legislature has passed Senate Bill No. 280, which creates a "board of auto mechanics examiners" before whom those who would work as mechanics must appear, be examined, passed and properly licensed—for a fee of $5; the license is good for a year, when it can be renewed and "the board may at any time revoke a license . . . for incompetency on the part of the holder . . . and for any other good and sufficient cause."

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Republic Trucks for Canada

ALMA, MICH., March 24—The Republic Motor Truck Co. is about to enter the Canadian automotive field. B. D. Jones resigned as sales manager to become general manager for Canada. The company will locate its plant in Windsor, Walkerville or Toronto.

Stephens Distributers Set Policies

Men Who Sell Given a Voice in Design and Production—Co-operative Spirit

FREEPORT, ILL., March 21—It is not an uncommon belief among dealers that there is too little attention paid by the engineering and designing departments of the motor car factories to suggestions from the distribution end of the business. This feeling is not unwarranted in some cases. Too often the designing department forgets that the distributers' and dealers' suggestions reflect the ideas of the owners.

More frequently, however, there are production and material difficulties which prevent the practical carrying out of the suggestions, but which the factory does not trouble itself to explain to its dealers.

Sometimes, also, the distribution is not a unit as to what it wants. Local conditions frequently reflect themselves in a demand for a certain feature in one territory, a feature which is directly opposite to the needs of another section.

Close co-operation between its distributing and manufacturing departments seems to have been worked out by the executives of the Stephens Motor Branch of the Moline Plow Co. in a way which gives the factory the benefit of the dealers' and distributers' first-hand information as to the needs of their territories and at the same time shows that their suggestions are given thorough consideration.

This was shown forcibly in the annual distributers' conference at the factory this week. Having a comparatively small number of distributers, each representing a large number of dealers, it is possible for the distributers to get together with the representatives of all the different departments of the factory and thresh out the pros and cons of all suggestions in open meeting. Consequently a feature of the three-day meeting was a series of "round-table conferences" in which all hands participated, with Sales Manager Clough in the chair.

They were really round-table conferences, for there were provided a number of small round tables with pads and pencils on each for the conferees to make notes. Each distributer was called on in turn to give his ideas on the point at issue—say, the color of the wheels—and when the distributers themselves did not agree the meeting was turned over to them until they decided what they did want. If what they wanted was not feasible from a factory standpoint they were told frankly why.

Also, they got first-hand information from the factory. Not only was Stevens' Plant Manager Leonard there, but the body man, the service manager, the engineman, etc., were on hand. In addition representatives from the factories making the units from outside were on the job to help out.

When, after the conferences, the distributers left town, they knew that the factory was doing everything possible to meet their ideas. Incidentally, it is only fair to say that AUTOMOTIVE INDUSTRIES' representative never attended a dealer's meeting at a factory at which there was less kicking. This, it is believed, is due in a measure to the fact that the distributers were taken into the confidence of the factory.

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Nebraska Legislates for Tractor Maintenance

LINCOLN, March 24—Legislators in Nebraska have introduced two bills which at least have novelty if nothing else, but which if passed would cause a lot of trouble.

The first of these is "Nebraska S.F. No. 86." Under its terms every person selling farm tractors in Nebraska must carry within the confines of the state a stock of repair parts sufficient to keep such machines in repair. Failure to do so makes any selling transaction void. The same provisions cover sales of motor cars.

The other, which is styled "Nebraska H. T. No. 85," provides for official tests of all tractors and would compel the maintenance of adequate service stations. According to the bill, every make and model of tractor offered for sale in the state must be officially examined and tested and passed upon by a board of three competent engineers under the control of state university management. Tests would be made of endurance, official rating of horsepower and fuel consumption per acre plowed. The bill also requires that an adequate stock of repair parts be carried, and failure to comply with the provisions bars offenders from doing further business in the state.

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Lists of Automobile Importers

WASHINGTON, March 24—The Department of Commerce has received lists of importers of automobiles and accessories who are interested in communicating with American manufacturers. They are located at Batavia, Dutch East Indies; Bombay, India, and Hongkong, China, Manufacturers can secure the lists and further information by addressing the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, and referring to file numbers 9504, 9521 and 9510.

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Kearns Has New 1½-Ton Chassis

BEAVERTOWN, PA., March 24—The Kearns Motor Co. is now building a 1½-ton truck with a Continental four-cylinder 3½ x 5 engine. Standard parts are assembled in the job, and the specifications include high tension magneto, Borg & Beck clutch, Hotchkiss drive, Muncie three-speed gearset, semi-elliptic springs, 136-in. wheelbase, solid tires 34 x 3½ in. front, 34 x 5 in. rear. The drive is internal gear, and roller bearings are used in the front wheels.

English Tractor Trial Rules Defined

Exhibition Planned for August by Motor Manufacturers and Traders

LONDON, March 14 (Special Correspondence) — The Society of Motor Manufacturers and Traders has decided to hold its annual farm tractor trial during the month of August. Rules have been drawn up which differ slightly from those in previous years. The complete regulations follow:

Resolved, that not more than two machines of any type should be entered, and that each machine should be observed by local farmers.

(a) Draw bar pull to be taken by dynamometer. Load to be added till dynamometer records "Stop." The technical adviser to settle speed at which pull to be taken.

(b) Fuel consumption in connection with price to be observed. Fuel, lubricating oil and water to be booked out daily.

(c) Ease of handling to include time in starting after machine left in open over night, uncovered. Also steering and distance in turning.

(d) Weight re drawbar efficiency to be taken in full working order on weighbridge.

(e) Reliability—All time lost in a working day to be recorded, except in stops for accident to plow, etc.

(f) Cost to be declared and a guarantee to be given of supply during current season at price declared. (Technical adviser to work out cost per drawbar horsepower—not brake horsepower.)

(g) General design—Simplicity of construction and accessibility to all parts.

(h) Facility for use of any other fuel than gasoline. Entrants to notify amount required in advance, and supply to be controlled by the society.

Plows—Resolved to invite plow manufacturers to offer facilities for demonstration by the entrants, informing them that nothing beyond 12 in. wide would be acceptable and that the depth of plowing would be 6 to 8 in.

Dynamometer tests to be made 2 days before trial to show how many furrows could be drawn.

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To Make War-Born Products

NEW YORK, March 21—The Aircraft & Motor Products Co. has been formed here, with offices at 299 Madison Avenue, and will manufacture products for aircraft and motor vehicles that have been developed primarily from successful war products. The company has developed a spark plug, has a line of cup greases and gear oils, a bronze bearing metal and will manufacture aluminum castings, bronze castings and gears. Rayburn Clark Smith of Philadelphia is president, other officers being: Vice-president, H. Allen Dalley, Philadelphia; general manager, Major Harry A. Budd, New York. Branches have been established in Philadelphia and Chicago. The company will brand its products "A-A."

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New United States 1½-Ton Truck $1,995

CINCINNATI, March 20—The United States Motor Truck Co. has added a 1½-ton truck to the United States line, and with the new addition the line comprises capacities from 1½ to 5 tons. This smallest model is to sell for $1,995 in chassis with seat, solid tires and regular equipment. The name will be Model N. The engine is a four-cylinder block type with 3¾-in. bore and 5-in. stroke. Cooling is by a centrifugal pump, a vertical tube radiator having cast tanks and a cast frame. The engine is three-point suspended in the frame, the third point being around the starting-crank housing and the rear support arms having recoil springs. The engine is designed to take an electric starting and lighting system, and this may be had at extra cost. The dry-plate clutch and the three-speed gearset are a unit with the engine.

Internal gear drive is used in the axle and all the brakes are on the rear wheels. The steering wheel is on the left side with the control levers in the center. Tires are 36 x 3½ front, 36 x 5 rear. Wheelbase is 120 in.

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New Reliance Production Plans

APPLETON, WIS., March 24—The Reliance Motor Truck Co., which recently reorganized its board of directors and official personnel, has perfected the organization of its engineering and production staff. Beginning with the delivery of its first truck to-day, the company is now on a regular production basis of one chassis a day.

Oscar Stegeman has assumed the position of chief engineer. H. F. Vahl is the new production manager. The present output of Reliance trucks is confined to a 1½-ton model, but after July 1 a new 2½-ton design will be put into production, and later a 3½-ton design will be included in the line. The company also has arranged to engage in the output of a truck axle, which is being marketed under the name of Badger external spur gear drive axle, in 1½, 2½, 3½ and 5-ton types. The same axle is used in Reliance trucks. John M. Balliet, Appleton, is president and general manager of the Reliance company.

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Kelsey Wheel Has $2,067,904 Surplus

DETROIT, March 22—A surplus of $2,067,904 is shown in the Kelsey Wheel Co.'s financial statement for the year ended Dec. 31 last, after all necessary deductions were made and $355,022 put aside as provision for federal taxes. This amount is $583,229 ahead of 1917 surplus. $1,565,625 is still due from the government for war contracts.

Consolidated balance sheet of Kelsey Wheel Co., Inc., and subsidiaries, as of Dec. 31, 1917 and 1918, compares as follows:

Assets

	1918	1917
Plant equipment, etc..	$2,457,577	$2,519,509
Patents, good will, etc.	10,000,000	10,000,000
Investments in other companies	59,000	.....
Inventories	2,104,089	2,212,839
Notes and accounts receivable	841,970	932,508
Cash	222,474	333,830
Due from U. S. Government	1,565,625	.....
Liberty bonds, etc.	176,083	65,347
Insurance premiums	14,644	10,475
Deferred charges	88,257	49,454
Total	$17,529,719	$16,123,960

Liabilities

Preferred stock	$2 909,000	$3,000,000
Common stock	10,000,000	10,000,000
Notes payable	1,090,000	290,000
Accounts payable	832,338	788,315
Sundry creditors, etc.	275,455	234,383
Provision for taxes	355,022	326,587
Surplus	2 067,904	1,484,675
Total	$17,529,719	$16,123,960

Gray & Davis Make Up Dividends and Retire Stock

BOSTON, March 26—The remaining dividend of $1.75 in arrears on preferred, and the regular quarterly dividend of $1.75, will be paid by Gray & Davis, Inc., on April 1 to stockholders of record March 21. The directors of the company have also voted to carry out the agreement made in February, 1918, with the preferred stockholders' committee to purchase on April 1 all preferred stock deposited with the committee at 103 a share and accrued interest. At the date of the directors' vote $439,400 out of a total issue of $600,000 was deposited with the committee. At present about $440,000 has been deposited with the committee, and will be retired on April 1. As there is only $600,000 preferred outstanding, by April 1 only about $150,000 will remain outstanding.

A few weeks ago a merger with the American Bosch Magneto Co., Springfield, was seriously considered, but called off at the last minute by mutual consent.

—

Prepare for Trans-Atlantic Flight

WASHINGTON, March 25—That the final preparations for a trans-Atlantic flight under the direction of the United States Navy are being completed is evidenced by the present search for a starting field by the Navy Department. A destroyer has been sent out to locate a suitable harbor or starting field, and Lieutenant-Commander Bellinger, who was detailed to assist in the project, is co-operating with the destroyer. It is now expected that there will probably be a fleet of four flying boats in the attempt.

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$998,887 Aviation Equipment Sold

WASHINGTON, March 26—Airplanes valued at $319,000 and airplane equipment valued at $679,887 were sold between March 8 and March 14 by the War Department, through the Director of Sales. The Motors and Vehicle Section sold equipment, accessories and a kitchen trailer for $1,298.10 during the same period. No trucks or passenger cars have been sold. Other sales made during this period were: Oils, greases, etc., valued at $35,228.48; machinery and machine tools, together with engineering equipment, $224,824.85; ferrous metals, $71,977.96, and non-ferrous metals, $34,591.83.

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Steele Goes With Dominick

NEW YORK, March 27—Charles M. Steele, who for some years has been out of active touch with the automobile industry, and who was formerly vice-president of the Carl M. Green Co., has associated himself with Dominick & Dominick, financial brokers in this city.

—

Dividends Declared

Goodyear Tire & Rubber Co., Akron, first preferred, quarterly dividend of 1¾ per cent, payable April 1 to stockholders of record March 15; second preferred, 2 per cent, quarterly, payable May 1 to stockholders of record April 15.

Edmunds & Jones Corp., Detroit, 1¾ per cent, quarterly, preferred, payable April 1, to stockholders of record March 20.

MacDonald in Charge of Federal Road Work

WASHINGTON, March 26—Thomas H. MacDonald, chief engineer of the Iowa State Highway Commission, has been appointed by the Secretary of Agriculture as engineer in immediate charge of the work under the Federal Aid Road Act, which provides for co-operation between the states and the Federal government in the construction and improvement of roads. Mr. MacDonald will assume his new duties as soon as he can close up his work in Iowa.

He will supervise and direct all the activities of the Bureau of Public Roads under the Federal Aid Road Act, including the expenditure of the additional appropriation of $209,000,000 provided by the Post Office Appropriation Act for the extension and development of highway construction during the present and the next two fiscal years.

For the time being he will devote his energies to the problems arising under the Federal Aid Road Act incident to the sumption and extension of road work.

—

Not to Take Over New Process

NEW YORK, March 24—In a news item last week it was stated that "The Meecham Gear Corp. has been organized to take over the New Process Gear Corp." The statement was incomplete and misleading due to the inadvertent omission of a word. It should have read "The Meecham Gear Corp. has been organized to take over *from* the New Process Gear Corp. the manufacture of rawhide pinions," etc.

Exports of Automotive Equipment for February and Seven Previous Months

(*Continued from page* 713)

	Month of February				Eight Months Ending February			
	1919		1918		1919		1918	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	2	$15,000	5	$31,155	43	$577,600	18	$192,620
Airplane parts	.....	276,129	.....	633,652	.....	9,493,241	.....	4,740,247
Commercial cars	1,403	4,270,542	766	1,917,638	7,711	21,283,362	9,229	24,967,225
Motorcycles	1,298	289,867	602	152,511	5,539	1,308,633	6,823	1,482,570
Passenger cars	3,041	3,719,485	3,584	3,079,191	19,523	22,333,972	37,630	31,672,242
Parts, not including engines and tires	.....	2,699,741	.....	1,962,797	.....	22,451,148	.....	21,298,655
Total value (cars, trucks and parts)	.....	$10,689,768	.....	$6,959,626	.....	$66,068,482	.....	$77,938,122
ENGINES								
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas	522	$105,449	2,450	$275,217	15,755	$2,473,026	25,296	$2,885,725
Marine, gas	457	315,085	310	153,383	3,770	2,100,886	5,231	1,640,258
Stationary, gas	1,599	305,538	1,955	286,765	15,154	2,213,037	16,368	1,885,019
Tractor, gas	2,245	2,145,152	1,368	1,121,535	14,568	16,169,936	11,851	12,157,018
Total value	.....	$2,871,224	.....	$1,836,900	.....	$22,956,885	.....	$18,568,020

EXPORTS BY COUNTRIES FEBRUARY, 1919

	Passenger Cars		Trucks		EIGHT MONTHS ENDING FEBRUARY, 1919 Passenger Cars		Trucks	
	No.	Value	No.	Value	No.	Value	No.	Value
Denmark	36	$48,289	.....	.....	143	$232,544	.....	.....
France	82	281,131	670	$3,035,379	605	740,894	2,939	$12,271,544
Norway	26	28,874	.....	.....	213	427,140	.....	.....
Russia in Europe	.....	.....	.....	.....	6	6,605	.....	.....
Spain	36	43,665	.....	.....	504	666,485	.....	.....
United Kingdom	3	2,836	9	14,247	96	142,733	858	2,509,692
Canada	281	290,788	128	132,873	1,984	1,837,035	1,087	1,423,921
Mexico	203	149,536	.....	.....	1,136	1,161,084	.....	.....
Cuba	213	290,807	34	92,429	1,175	1,784,148	395	785,515
Argentine	213	324,193	11	21,794	1,004	1,280,434	47	86,688
Chile	64	152,919	.....	.....	810	1,301,947	.....	.....
Uruguay	25	38,106	.....	.....	487	454,000	.....	.....
British India	44	58,428	.....	.....	72	102,169	.....	.....
Dutch East Endies	72	72,911	.....	.....	1,229	1,549,354	.....	.....
Russia in Asia	.....	.....	.....	.....	3	11,734	15	18,200
Australia	493	447,408	.....	.....	2,383	2,222,360	.....	.....
New Zealand	222	225,262	.....	.....	933	912,402	.....	.....
Philippine Islands	131	125,943	.....	.....	890	953,527	.....	.....
British South Africa	140	159,483	.....	.....	810	835,048	.....	.....
Other Countries	757	978,906	551	973,820	5,040	5,712,329	2,375	4,187,802
Totals	3,041	$3,719,485	1,403	$4,270,542	19,523	$22,333,972	7,711	$21,283,362

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
- Muriatic, lb. ..... .02 -.03
- Phosphoric (85%).. .35 -.39
- Sulphuric (60%), lb. .008

Aluminum:
- Ingot, lb. ..... .31
- Sheets (18 gage or more), lb. ..... .42
- Antimony, lb..... .07 -.07¼

Burlap:
- 8 oz., yd..... .06¼
- 10½ oz., yd..... .08½

Copper:
- Elec., lb..... .14¾-.15
- Lake, lb. ..... .15½

Fabric, Tire (17¼ oz.):
- Sea Is., combed, sq. yd. 1.50
- Egypt, combed, sq. yd. 1.25
- Egypt, carded, sq. yd. 1.15
- Peelers, combed, sq. yd. 1.10
- Peelers, carded, sq. yd. 1.00

Fibre (⅛ in. sheet base), lb. ..... .50

Graphite:
- Ceylon, lb. ..... .90 -.22
- Madagascar, lb.... .10 -.15
- Mexico, lb. ..... .03¾

Lard:
- Prime City, gal....2.40
- Ex No. 1, gal.....1.10 -1.15

Linseed, gal. .....1.45 -1.48

Petroleum (crude):
- Kansas, bbl.....2.25
- Pennsylva'a, bbl.4 00
- Menhaden (dark), gal. ..... .95

Lead, lb. ..... .05 -.05¼

Leather:
- Hides, lb..... .24 -.39½

Nickel, lb. ..... .40

Oil:
- Gasoline:
  - Auto, gal. ..... .24½
  - 68 to 70 gal..... .30½

Rubber:
- Plantation:
  - First latex pale crepe, lb..... .52
  - Brown crepe, thin, clear, lb. ..... .46
  - Smoked, ribbed sheets, lb..... .51
- Para:
  - Up River, fine, lb. .55½
  - Up River, coarse, lb. ..... .34
  - Island, fine, lb..... .47½

Shellac (orange), lb. .60 -.64

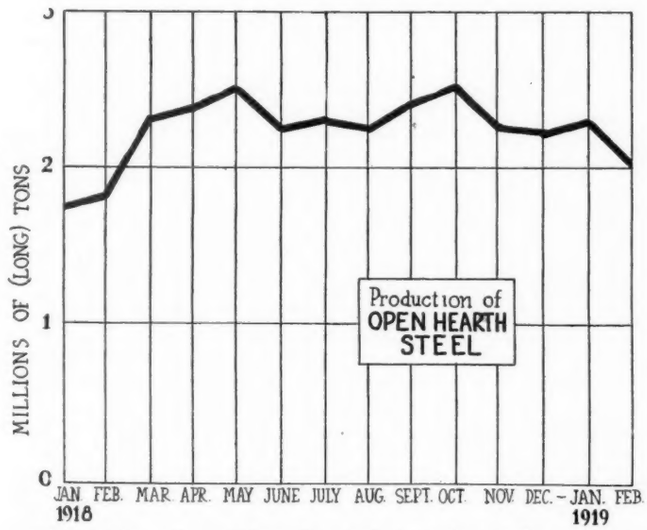
Spelter, lb..... .06¼-.06½

Steel:
- Angle beams and channels, lb..... .03
- Automobile sheet (see sp. table).
- Cold rolled, lb..... .0625
- Hot rolled, lb..... .039

Tin ..... .71 -.72

Tungsten, lb.....1.50 -2.10

Waste (cotton), lb... .12¾-.17



Production of open-hearth steel is being fully maintained. Figures for January and February, 1919, show substantial gains over those for a similar period in 1918

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	$5.95	$5.85
Automobile body stock deep stamping.	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping.....	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping.....	6.30	6.20

Automobile Sheet Extras for Extreme widths:
- Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
- Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
- Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
- Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Blank Sheet Extras to Apply to Narrow Widths:
- Oiling, 10c. per 100 lb.
- Patent leveling, 25c. per 100 lb.
- Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent. less than the invoice Pittsburgh price for corresponding primes.

Automotive Securities on the Chicago Exchange at Close March 22

	Bid	Asked	Net Ch'ge
Auto Body Company.....	8	9¼	..
Briscoe Motor Car com....	13	..	+3
Briscoe Motor Car pfd....	50	65	..
*Chandler Motor Car.....	125	127	—1⅞
Chevrolet Motor Car.....	189	191	..
Cole Motor Car Co.....	93	105	+3
Continental Motors com...	7¾	8¼	..
Continental Motors pfd....	97	..	..
Edmunds & Jones com....	15	20	..
Edmunds & Jones pfd.....	75	90	..
Electric Storage Bat.....	64	67	+5
Federal Motor Truck.....	34	36	—1
Fisher Body Co. com.....	48	49	—9
Fisher Body Co. pfd.....	95	98	+3
Ford Motor of Canada....300		310	..
General Motors com.....	162½	163½	—3
General Motors pfd.....	89	91	+1⅜
Hupp Motor Car com.....	8¼	8¾	—½
*Hupp Motor Car pfd.....	95	100	+5
Kelsey Wheel Co. com....	39	41	—1
Kelsey Wheel Co. pfd.....	94½	96½	..
Manhattan Electric S. com. ..		48	..
Maxwell Motor com.....	35⅜	36⅜	—3⅞
Maxwell Motor 1st pfd....	63	64	—4⅞
Maxwell Motor 2nd pfd...	28⅜	29⅜	—2⅛
*McCord Mfg. com.....	32	35	+2
*McCord Mfg. pfd.....	90	93	—1
Mitchell Motor Co.....	27	32	..
Motor Products Corp.....	..	35	..
Nash Motors Co. com.....220		235	+5
Nash Motors Co. pfd.....	95	100	—¼
National Motor Co.....	15	20	..
Packard Motor Car com..114		118	..
Packard Motor Car pfd...100		102	..
Paige-Detroit Motor com..	28½	29½	+½
Paige-Detroit Motor pfd..	8¾	9¾	..
Peerless Motor Truck.....	22	24	—1
Pierce-Arrow M. Car com.	44¼	45¼	—⅛
Pierce-Arrow M. Car pfd.104½		106	..
Premier Motor Corp. com.	5	..	..
Premier Motor Corp. pfd..	..	75	..
Prudden Wheel Company..	18	19	..
Reo Motor Car Co.....	23¾	24½	+⅜
Republic M. Truck com...	36	37½	+½
Republic M. Truck pfd...	87	90	..
Saxon Motor Car com.....	6½	8½	—2¾
Scripps-Booth Corp.	21	25	..
*Stewart Warner S. Corp.	90¾	92¾	+¾
Stromberg Carburetor Co.	37	39	—3
Studebaker Corp. com....	62	63	—1
Studebaker Corp. pfd.....	94	97	..
*Stutz Motor Car Co.....	51	52	—1½
United Motors Corp.....	43½	45½	—¼
*White Motor Co.....	52½	53½	—1
*Willys-Overland com. ...	28½	29½	+1¼
Willys-Overland pfd.	92	93	..
RUBBER STOCKS			
Ajax Rubber Co.....	74¼	75	..
*Firestone T. & R. com...149		152	+7
Firestone T. & R. pfd.....	99½	101½	+½
Fisk Rubber Co. com.....103		105	—1½
Fisk Rubber 1st pfd.....100		105	..
Fisk Rubber 2nd pfd.....101		105	..
Fisk Rubber 1st pfd. conv.	99	101	..
Goodrich, B. F., com.....	68¾	69¾	..
Goodrich, B. F., pfd.....106		106½	—⅛
Goodyear T. & R. com....272		276	—3
*Goodyear T. & R. 1st pfd.106½		107½	..
Goodyear T. & R. 2nd pfd.107		108	+⅛
Kelly Springfield com.....119½		120½	..
Kelly Springfield pfd.....	95	97	..
Lee Tire & Rubber Co....	25	26	..
Marathon Tire & Rubber..	55	75	..
Miller Rubber Co. com....175		178	+7
Miller Rubber Co. pfd.....101½		103	+½
Rubber Products Co.....133		135	+6
Portage Rubber Co. com..163		165	—3
Swinehart T. & R. Co.....	80	85	..
U. S. Rubber Co. com....	82½	83	..
*U. S. Rubber Co. pfd....111½		112½	..

*Ex dividend.

Hemingway Succeeds Bradley as Manager of M. A. M. A.

NEW YORK, March 24—L. M. Bradley, who since October, 1916, has been manager of the Motor Accessory Manufacturers' Association, has resigned. Early in December he was granted a three months' leave of absence because of illness and immediately left New York for Sea Breeze, Fla., where he is at present. M. L. Hemingway, who about a month ago was appointed assistant manager, will succeed him. Prior to his connection with the M. A. M. A. Hemingway was with the Rubber Association of America.

—

Price New Safety Council Manager

CHICAGO, March 24—C. W. Price has been elected general manager of the National Safety Council to succeed W. H. Cameron, who has resigned to become manager of Industrial Relations for the Eastman Kodak Co. Mr. Price has been field secretary for the council for some time.

—

John F. Koch, treasurer of the Evinrude Motor Co., Milwaukee, died March 17 at Los Angeles, where he went late last fall for his health. Mr. Koch was 45 years of age.

—

E. L. Moorman, Beloit, Wis., has become manager of the sales department of the Highway Trailer Co., Edgerton, Wis. He has been sales manager of the Beloit Gas & Electric Co. for many years.

—

W. P. Berrien, formerly with the Firestone Tire & Rubber Co., and the Batavia Rubber Co., and also with the Star P. & V. Corp., which has recently merged with the Allied Industries Corp., will devote all his time to the automotive lines in the new relation.

—

P. E. Barker, who was formerly experimental engineer of the Northway Motor Manufacturing Co., and more recently research engineer at the Aluminum Castings Co., Cleveland, is now in charge of the truck and motor equipment department of the Van Dorn Iron Works Co., Cleveland.

—

Dale E. Eller, who has been a lieutenant in the field artillery, and **Howard M. Benedict,** who has been a lieutenant in the air service, have been honorably discharged, and have returned to their positions with the Oakes Co., Indianapolis. Mr. Eller is connected with the sales-engineering department, and Mr. Benedict with the pressed steel stamping department.

—

Lt. E. A. Wales, formerly chief of production, motors division, Quartermaster Corps, Cleveland, has re-entered the employ of the Raybestos Co., Bridgeport, Conn., and will resume his pre-war duties as manager of its Detroit office at 1713 Dime National Bank Building.

Men of the Industry

Changes in Personnel and Position

Lawrence W. Enos, until recently a lieutenant in the Quartermaster Corps, has joined the Firestone Steel Products Co., Akron, as manufacturers' representative in the Detroit district. Before entering service he was with the Steel Products Co., Cleveland.

—

Walter P. Hanson has joined the Haynes Automobile Co., Kokomo, as assistant advertising manager. Before his enlistment in the navy he was a newspaper and magazine writer.

—

C. H. Breaker has been appointed sales manager of the Diamond Chain & Manufacturing Co., Indianapolis. For the past year he has been in the air service, and for 9 years previous was with the Larkin Co.

—

H. S. Benjamin, for some time advertising manager for the Holley Kerosene Carburetor Co., Detroit, has resigned and has been succeeded by Earl Holley. Mr. Benjamin's future plans have not been announced.

—

W. S. Butler has received his discharge from the army and has joined the district sales manager's staff of the Commerce Motor Car Co., Detroit.

—

G. E. Wirsching, formerly with the General Motors Export Co., has been made assistant to E. F. Sayers, general manager of the export division of the Garford Motor Truck Co., Lima, O.

—

Harry J. Sproat has been made secretary and factory manager of the New Way Motor Co., Lansing. He was formerly manager for the Olds Motor Works.

—

G. B. Sharpe, New York, has been appointed assistant sales manager in charge of advertising for the Cleveland Tractor Co., effective April 1. He has been in charge of the advertising and sales promotion for the De Laval Separator Co.

—

J. R. Hall, for seven years production engineer with the Chandler Motor Car Co., Cleveland, has been appointed production manager for the Cleveland Automobile Co.

—

G. B. Sharpe has been appointed assistant general sales manager of the Cleveland Tractor Co., Cleveland. He will have charge of advertising and sales promotion.

—

F. A. Falkenbach, sales manager of the Modern Tool Die & Machine Co., Columbus, died at Youngstown on March 14.

Ford Organization Shaken by Recent Resignations

DETROIT, March 24—John R. Lee is the latest official to resign from the Ford Motor Co. His resignation came Thursday, following closely that of Harold Wills, chief engineer and production head, who severed his connections earlier in the week. Mr. Lee has not made known his future plans, but states he will probably remain in the automotive industry.

Ever since Norval A. Hawkins, sales engineer, quit the Ford company several weeks ago, automotive circles have been full of rumors concerning administration changes at the Ford company, and, needless to say, these changes are coming with startling rapidity, and the Ford organization is said to be quite seriously shaken.

John R. Lee worked out the profit sharing and wage adjustment policy of the Ford company. He was also the head of the sociological work which attracted the attention of manufacturers and large employers of labor everywhere. When this country entered the war Mr. Lee represented the Ford Motor Co. in Washington, being the point of contact between his company and the government. He was a member of the Automotive Industries Committee created to represent the motor car industry and to assist both the government and the manufacturers in placing and executing ammunition contracts. He was a member of the executive committee of the Ford Motor Co.

Before joining the Ford organization eight years ago, he was president of the John R. Keim Mills, Inc., Buffalo, manufacturers of pressed steel products. This company was purchased by the Ford company and moved to Detroit.

—

W. H. Diefendorf, Syracuse, has resigned his position as chief engineer and director of the New Process Gear Corp. and is now with Weeks-Hoffman Co. of that city.

—

I. B. Meers has been appointed general sales manager of the Panhard Motors Co., Grand Haven, Mich. He will handle export affairs as well as American sales.

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A. E. Vinton, connected with the National Motor Car & Vehicle Corp., Indianapolis, for the past 12 years as assistant sales manager and later as export manager, has been appointed general sales manager for the New Jersey Car Spring and Rubber Co., Jersey City, N. J.

—

F. X. Newman has resigned his position with the Wright-Martin Aircraft Corp., New Brunswick, N. J., to become vice-president and sales manager of the Automatic Safety Tire Valve Corp., Long Island City.

—

Lou J. Sackett, a car salesman for the past 23 years, has resigned from the Cadillac Co. of New England, but has not as yet announced his future plans.

Pros and Cons of British Import Restrictions

LONDON, March 10 (Special Correspondence)—Although no definite action has been taken by the British Government in regard to removing the prohibition of automobile imports, present indications seem to point to the adoption of some sort of a rationing plan on the basis of 1914 imports. In other words, taking the 1914 imports as about 1800 cars, it is expected that the government will permit some percentage of this amount to be imported.

British manufacturers are strongly against complete removal of this prohibition. It is their contention that the British industries require 12 to 18 months to resume pre-war status, and that American products should be kept away at least for the remainder of this year, or, if the rationing plan is adopted, only about 50 per cent of the number of cars imported in 1914 should be permitted to come in.

The importers point out that if it is the object of the government simply to prevent American importers having an unfair advantage over British manufacturers, the industry should be put back on the basis of 1914, and 100 per cent imports permitted.

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South American Shipping Preferences Canceled

WASHINGTON, March 21—Ocean shipping preference procedure for the East Coast of South America has been canceled, according to an announcement made to-day by the War Trade Board. Steamship companies have been instructed to disregard any outstanding preferences heretofore granted.

This action has been taken because of information received that the allotment of shipping made by the Shipping Board for the East Coast of South America trade will be sufficient to take care of all the cargo now offered or which will be offered in the immediate future for these markets.

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Automotive Restrictions in Holland

AMSTERDAM, HOLLAND, Feb. 27 (Special Correspondence)—Late in 1918 and early this year a shortage of gasoline in Holland, due to the exhaustion of supplies and the lack of imports, prohibited the use of passenger cars, trucks and motorcycles except for military purposes. In some of the big towns it was permissible to use cars for conveying sick persons to hospitals and for official business connected with the various foreign legations. Under ordinary circumstances oil and gasoline are comparatively cheap inasmuch as they are not taxed and supplies are received by tank steamer from America, India and Roumania principally.

In consequence of the impossibility of importing tires due to war restrictions, a tire industry has been started, and one factory, the Rubberfabrick "Vredestein," at Loosduinen (near The Hague), is bringing out what is described as a fair tire. This company is making only pneumatics and has not as yet attempted solids.

There are very few motor trucks in use in Holland. The greatest use of such vehicles is made by the war office. Private industry and commerce possess only a small number of trucks, and these cannot be used at present. Most of them are about 2-ton capacity, with a few 4 and 3½-ton vehicles. Light delivery trucks and those of 1-ton capacity are few.

—

Russian Buying Agency Established

SAN FRANCISCO, March 24 — The All-Russian Central Union of Co-operative Societies has been formed, with offices at 167 Post Street, to buy automotive products, etc., on behalf of Russian distributers, dealers and consumers, and to promote commercial intercourse generally through the control of that country's stocks of raw material. A request is made for duplicate catalogs and price lists.

—

France Lifts Import Restrictions

WASHINGTON, March 21—France has removed import restrictions from many commodities, including the following: Petroleum oils, crude and refined; heavy oils and other mineral oils; iron ore, copper ore, lead ore, tin ore, zinc ore, nickel ore, iron scrap, iron filings and copper sulphate, and wooden handles for agricultural implements.

—

Names of Foreign Consignees Unnecessary

WASHINGTON, March 22—Names of foreign consignees need no longer be included on the export bills of lading according to an announcement by the War Trade Board. It is believed that exporters are now thoroughly familiar with the enemy trading act and hence will not need to be checked up.

Exports of Automobile Tires by Countries, for the Last Half of 1918

	July	August	September	October	November	December
France	$68,000	$2,351	$48,744	.....	$102,365	203,689
Belgium	.....	.....	.....	.....	.....	$28,718
Italy	585	.....	.....	.....	.....	.....
Norway	.....	.....	.....	.....	4,396	2,272
Portugal	1,437	.....	400	537	2,014	.....
Russia in Europe	.....	211	.....	.....	.....	.....
Spain	.....	.....	176	.....	.....	20,723
Sweden	.....	.....	.....	.....	.....	18,825
Switzerland	.....	.....	.....	.....	.....	.....
England	36,032	3,100	25	535	38,881	.....
Bermuda	.....	.....	.....	.....	.....	.....
British Honduras	73	503	316	54	1,059	498
Canada	38,086	110,757	89,697	27,619	20,861	63,325
Costa Rica	.....	917	621	70	579	2,318
Guatemala	1,045	3,683	6,845	2,877	764	428
Honduras	1,264	3,304	775	949	763	1,758
Nicaragua	243	389	650	348	383	730
Panama	15,731	8,462	4,287	3,395	13,867	6,217
Salvador	783	3,423	897	3,409	3,113	5,411
Mexico	78,033	115,305	118,873	55,419	135,558	63,254
Newfoundland and Labrador	1,144	525	1,023	874	3,940	1,446
Barbado	490	275	10,040	1,434	4,043	4,103
Jamaica	17,312	20,816	5,538	3,696	715	28,022
Trinidad and Tobago	6,522	9,397	2,826	5,291	17,760	8,042
Other British West Indies	3,282	2,662	1,440	3,400	3,225	6,778
Cuba	161,952	116,376	213,575	104,443	235,057	98,393
Danish West Indies	463	141	2,882	1,122	660	821
Dutch West Indies	836	1,615	1,533	2,802	328	1,076
French West Indies	504	3,382	2,309	422	5,176	20,700
Haiti	985	4,198	1,295	3,152	3,462	3,231
Dominican Republic	3,202	161,500	7,622	6,699	5,792	17,940
Argentina	174,177	278,432	95,930	8,370	154,904	147,446
Bolivia	2,479	.....	165	.....	14,662	5,252
Brazil	20,556	6,054	2,842	32,419	40,584	9,095
Chile	48,344	52,981	106,090	55,198	85,589	133,717
Colombia	1,620	2,667	6,274	5,428	3,427	860
Ecuador	790	4,059	4,174	2,878	4,221	3,930
British Guiana	.....	7,386	13,289	1,643	12,546	4,624
Dutch Guiana	2,628	38	79	.....	640	.....
French Guiana	75	.....	.....	.....	.....	.....
Paraguay	.....	264	.....	.....	.....	.....
Peru	18,524	14,043	11,077	24,423	29,226	58,939
Uruguay	14,913	48,937	8,885	.....	.....	.....
Venezuela	10,429	14,826	2,044	11,347	12,200	16,719
China	3,518	8,749	5,580	11,613	15,306	8,770
Chosen	.....	.....	.....	1,388	.....	.....
British India	47,879	36,784	.....	4,144	5,658	38,681
Straits Settlements	62,053	32,416	226,602	10,582	.....	21,013
Other British East Indies	12,507	3,052	.....	2,340	.....	2,337
Dutch East Indies	85,619	47,659	95,091	38,592	43,011	106,064
French East Indies	.....	.....	.....	.....	.....	1,514
Hongkong	310	1,746	.....	90	7,847	5,296
Japan	12,736	10,844	2,647	16,189	9,365	5,660
Russia in Asia	.....	.....	.....	8,806	.....	.....
Siam	4,848	7,584	.....	12	.....	.....
Turkey in Asia	.....	.....	.....	1,067	.....	.....
Australia	152,424	116,541	77,108	29,047	76,706	45,056
New Zealand	43,773	159,469	55,422	38,835	38,010	19,206
Other British Oceania	96	60	49	240	172	.....
French Oceania	710	1,588	735	2,615	145	280
German Oceania	.....	400	.....	1,552	298	604
Philippine Islands	51,735	132,475	58,707	123,438	29,168	28,045
British West Africa	6,837	4,040	.....	25	.....	14,308
British South Africa	.....	203	25,787	266,770	79,577	269
British East Africa	.....	.....	.....	.....	165	.....
Madagascar	.....	.....	.....	.....	565	.....
French Africa	.....	.....	.....	.....	.....	131
Portuguese Africa	.....	.....	.....	2,606	92	.....
Totals	$1,217,584	$1,566,689	$1,320,966	$930,204	$1,268,845	$1,281,534

Exports of Cars, Trucks and Parts During the Calendar Year 1918

	Passenger Cars		Trucks		Parts
	No.	Value	No.	Value	Value
Azores and Madeira Islands	....	.....	....	.....	$1,793
Denmark	98	$159,516	....	.....	5,296
France	1,003	1,134,818	3,356	$12,920,029	5,069,426
Gibraltar	....	.....	27	58,325	.....
Greece	1	2,000	14	32,000	13,415
Iceland and Faroe Island	40	34,062	1	2,245	5,268
Italy	99	82,957	78	115,632	67,677
Norway	198	430,514	108	320,574	65,585
Portugal	168	215,062	16	56,804	25,890
Russia in Europe	10	8,325	2	5,454	177
Spain	808	1,042,789	55	141,883	116,691
Sweden	1	2,800	....	.....	.....
Switzerland	1	1,646	....	.....	54
England	398	997,342	2,080	5,999,541	6,951,699
Scotland	25	85,000	182	667,413	154,686
Ireland	....	.....	2	4,276	.....
Bermuda	....	.....	....	.....	4
British Honduras	7	5,450	3	4,534	3,696
Canada	8,543	7,141,406	1,596	2,035,464	11,617,494
Costa Rica	41	20,100	....	.....	2,772
Guatemala	15	21,914	1	1,312	6,336
Honduras	11	15,443	4	2,017	10,262
Nicaragua	69	51,829	3	8,251	6,305
Panama	65	55,187	45	44,573	56,855
Salvador	62	77,184	3	10,561	9,970
Mexico	1,915	1,539,263	397	524,035	506,747
Miquelon, Langley, etc	....	.....	....	.....	94
Newfoundland and Labrador	84	97,861	6	6,247	7,257
Barbados	21	12,506	7	15,192	14,254
Jamaica	142	104,595	12	7,575	61,236
Trinidad and Tobago	86	64,995	12	19,893	49,765
Other British West Indies	43	26,192	9	6,304	13,840
Cuba	1,780	2,638,001	557	1,109,368	1,065,816
Danish West Indies	149	13,069	....	.....	3,105
Dutch West Indies	7	4,233	....	.....	3,584
French West Indies	75	63,150	14	22,836	44,575
Haiti	92	59,098	10	9,664	21,650
Dominican Republic	220	169,285	19	16,497	59,120
Argentina	1,628	1,673,137	45	40,707	2,100,114
Bolivia	15	29,187	16	41,116	7,303
Brazil	1,108	856,374	37	42,481	221,835
Chile	1,734	2,315,386	154	239,621	659,544
Colombia	126	95,677	4	7,385	26,864
Ecuador	63	73,953	6	10,420	8,558
British Guiana	62	45,467	8	7,700	41,985
Dutch Guiana	2	730	1	1,000	2,445
French Guiana	3	1,236	....	.....	213
Paraguay	....	.....	....	.....	719
Peru	626	823,762	100	246,392	116,721
Uruguay	1,351	799,787	15	13,512	137,991
Venezuela	118	104,942	7	7,100	57,134
Aden	6	5,049	....	.....	227
China	874	896,728	42	65,085	70,654
British China	1	824	....	.....	.....
French China	1	775	2	5,490	.....
German China	....	.....	....	.....	290
Japanese China	58	29,335	....	.....	855
Chosen	5	3,595	....	.....	10,943
British India	72	70,254	11	22,043	226,131
Straits Settlements	76	72,075	81	120,338	111,984
Other British East Indies	1	1,255	2	5,900	20,646
Dutch East Indies	1,260	1,567,766	154	335,536	404,048
French East Indies	17	24,254	1	1,800	2,458
Hongkong	129	119,958	9	10,970	13,219
Japan	2,699	2,877,692	605	895,125	429,543
Persia	10	5,673	4	2,712	4,170
Russia in Asia	3	11,734	15	18,200	198
Siam	85	75,860	4	6,342	9,199
Turkey in Asia	6	3,965	....	.....	3,764
Australia	3,826	3,271,317	38	66,254	1,613,333
New Zealand	1,418	1,228,864	84	128,215	375,715
Other British Oceania	25	19,192	1	1,835	4,622
French Oceania	10	8,655	5	6,600	6,950
German Oceania	10	7,035	4	4,213	5,123
Philippine Islands	1,690	1,462,571	152	205,519	311,257
British West Africa	128	80,908	30	25,946	48,330
British South Africa	1,205	1,070,570	36	44,254	472,356
British East Africa	77	59,992	....	.....	11,894
Canary Islands	2	730	....	.....	1,144
French Africa	130	74,144	12	9,817	20,929
Liberia	....	.....	....	.....	18
Madagascar	1	854	....	.....	215
Morocco	....	.....	....	.....	1,415
Portuguese Africa	12	8,598	4	7,725	1,122
Egypt	6	20,850	....	.....	473
Totals	36,936	$36,278,292	10,308	$26,814,952	$33,607,050
SHIPMENTS TO NON-CONTIGUOUS TERRITORIES					
Alaska	8	$7,590	7	$15,469	$37,071
Hawaii	81	107,064	38	76,930	333,720
Porto Rico	188	264,475	20	58,487	241,562
Totals	277	$379,129	65	$150,886	$612,353

This table supplements the monthly tables of exports given singly for the last six months in AUTOMOTIVE INDUSTRIES, *and gives figures for all of the individual countries, including those generally grouped under the collective heading "Other Countries"*

Specifications for Trinidad Purchasers

WASHINGTON, March 22—A wheel track of 56 in., ground clearance not less than 8 in., wheel base between 108 and 125 in. and a turning radius of 20 ft. are the specifications demanded by the Trinidad automobile purchasers, according to the Trinidad Automobile Association, Trinidad, British West Indies. These specifications were the result of questions asked by the Association of British Motor and Allied Manufacturers of England, who are apparently planning to capture this trade.

New Zealand Ready for Car and Truck Imports

CHRISTCHURCH, NEW ZEALAND, Jan. 10—New automobiles are in great demand in New Zealand but are difficult to obtain, American cars being the only new ones on the market. As in America, automobiles are largely utility vehicles, 99 per cent of them coming under this classification in the country districts and 90 per cent in the towns and cities.

It is questionable what will be the attitude in New Zealand with regard to American and English cars after the war. There is a strong feeling that British cars will sell at better prices than American cars as soon as they are on the market, because the medium-priced British car retains its mechanical condition, finish, upholstery and smoothness of running much longer than the correspondingly-priced American car.

Farm tractors are not making much headway except in such areas as Canterbury Plains and one or two other parts of the South Island, where there are cultivated areas of fairly good size. In North Island the country is hilly and broken, and wet soil conditions have not proved suitable for tractor use. In a recent demonstration over such soil the tractor bogged on the first trip across the field, and as farmers here expect the tractor to be practically the same as a horse, there is not much prospect for its speedy advance.

One of the greatest difficulties in New Zealand is the shortage of good repairmen. The average motor mechanic, as he is styled here, is usually a half-trained person whose work is of low order.

Electric trucks are making great headway here due to the cheap current obtained from the government's water power system. In North Island, dairy companies are installing their own electric charging plants and using electric trucks for collecting cream from farmers. The use of the electric truck is accelerated because of the high price of gasoline, which is selling at 90 cents per imperial gallon.

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Belgium Wants Heavy Import Duty

PARIS, Feb. 17—Automobile import duties in Belgium are still at pre-war rates, which is from 10 to 15 per cent of the value. Although France and England are free of duty it is believed that this will shortly be replaced by an import duty of 76 per cent in France, and 80 per cent in England, as a temporary measure which may remain in effect for one year.

Belgian manufacturers are not satisfied with this and have taken steps to bring it to the attention of the government, with the hope of obtaining an import duty about equal to that of France and England.

An endeavour has been made by Belgian automobile dealers to obtain licenses for the importation and sale of cars, to be given only to those persons who were actively engaged in the auto-

mobile industry before the war. It is claimed that large numbers of newcomers, who have absolutely no connection with the automobile industry, are now importing cars, to the detriment of men who have been in this business for a number of years.

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Passes Oil Leasing Bill

WASHINGTON, March 22—The House to-day adopted the conferee report on the Oil and Mining Land Leasing bill which was described in a past issue of AUTOMOTIVE INDUSTRIES and which makes possible the leasing of 6,000,000 acres of oil lands owned by the Government. In payment for the leases by companies or individuals the Government will receive royalties and rentals and reserves the right to control and regulate the development.

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Oil Found in England

WASHINGTON, March 22—The United States Fuel Administration has received information by cable of the reported discovery of oil in England. The cable states that considerable gas has been found, but no oil has yet been struck.

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International Exhibits Scheduled

PARIS, March 10 (Special Cable)—At the first meeting of an International Automobile Manufacturers' Congress, held during the progress of the Lyons Fair, a circuit of automotive exhibits was arranged and dates set for the forthcoming French and English shows. The congress, which includes a branch representing America, has set the following dates:

Paris (Grand Palais)	October 15
London (Olympia)	November
Brussels	December
New York	January
Chicago	February

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Air Director's Authority and Functions Defined

WASHINGTON, March 24—To enable Maj. Gen. C. T. Menoher, director of the Air Service, to exercise the necessary supervision, control and direction over the Bureau fo Aircraft Production and the Division of Military Aeronautics, with which he is charged by the Secretary of War, the following was announced by the Chief of Staff:

> The Director of Air Service will carry out the duties of the Chief of the Air Service, as prescribed in Article LXXXI, Army Regulations, 1913. He will exercise, under the direction of the Chief of Staff, full and complete supervision, control and direction over the Bureau of Aircraft Production and the Division of Military Aeronautics, in all that pertains to administration, supply, instruction, training and discipline.

General Orders, No. 80, War Department, 1918, have been amended by striking out the words, "the Directors of Military Aeronautics, of Aircraft Production," and substituting the words, "the Director of Air Service."

Germany Increases Automobile Output

Many Companies Add to Their Capital — Dividends Also Enhanced, Some 16%

WASHINGTON, March 24—The difficulties of wartimes have affected the German automobile industry but very slightly, according to a report received here by the Department of Commerce. Nearly all companies have greatly increased their production and their equipment. The typical factor in this industry has been that during the war, owing to the excess of demand over supply, the manufacturers have not been concerned with the finding of markets, as a result of which production has been intensive.

A measure of the increase of motor producing capacity during the war is clearly illustrated by the figures given in the German press of the increase of capital of companies concerned in that production. Thus the Daimler and Bayersche Motorwerke A-G. during the past two years have increased their capitalization by 15,000,000 marks. A considerable increase in the working capital is also noticed, as for example Nationale Automobile Gesellschaft and Hansa Lloyd, the latter increasing its capitalization from 4,400,000 to 20,000,000 marks. The pre-war value of a mark was 24 cents.

The unprecedented flow of money into this industry is remarked on by the German press as not found in other industrial lines and this condition has attracted the attention of the German government, arousing it to oppose any plans looking to a further increase in the capital of these stock companies.

Parallel with the growth of working capital and the increase in the scale of production, there is also a considerable increase in the dividend. Companies which before the war made no profit are now making as much as 16 per cent net. The German press considers that the industry has opportunity for large development after the war.

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U. S. May Trade with Germany and German Colonies

WASHINGTON, March 22—The War Trade Board will now issue licenses for the importation of ferromanganese from all countries where it has been shown by conclusive evidence that such ferromanganese was contracted for by American consumers prior to April 6, 1917.

It is now permissible for persons in the United States to trade and communicate with persons residing in the colonies owned or controlled by Germany on August 1, 1914, subject to the rules and regulations of the War Trade Board. Individual import licenses will be required for importations into the United States from such territory, and individual export licenses for exports to such territory. No official advices have been received as to what the import regulations in this territory will be, if any.

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England-Belgium Air Freight Service Planned

WASHINGTON, March 24—An aerial freight service is contemplated between Folkestone, England, and Ghent, Belgium. English manufacturers have been finding it next to impossible to ship goods to Belgium by ordinary transport, owing to the congestion of the docks in that country, and the Aircraft Transport & Travel Co. was quick to realize the opportunity thus offered to demonstrate the possibilities of aircraft for commercial purposes. The company has entered into negotiations with British manufacturers interested in the forwarding of goods to Belgium by air.

The governments of Great Britain and Belgium have been approached in the matter, and the Belgian government has already issued the special certificates necessary for this form of transport. The British Air Ministry has given its consent also to the main scheme proposed by the Aircraft Transport & Travel Co., but stipulates that pilots of the Royal Air Force shall undertake all the aerial trips made.

The load carried will be about 2 tons of foodstuffs, clothing and other necessities. The extension of this service to Antwerp and Brussels is planned.

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Canadian Municipalities May Impose License Fee

QUEBEC, March 24—Power to impose a tax or license fee on owners of motor vehicles used to carry on the business of cabman or common carrier is given to municipalities in a bill which Hon. Walter Mitchell, provincial treasurer, has introduced in the Legislative Assembly. When a man in the cartage business gave up horses and bought a truck to transport materials, he paid a tax to the Provincial Government under the Motor Vehicle act, but nothing to the municipality. Thus the municipality lost the revenue it had obtained from him when he had used horses.

The municipalities are also given power to make by-laws for the locating of cab stands and to put into force a tariff of fares which may be charged by motor and other vehicles.

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Mechanics' License Bill to Be Pushed Next Session

TOPEKA, KAN., March 22—The Kansas law regarding the licensing of mechanics has been killed in committee, and those actively engaged in disposing of this pernicious legislation were warned that two years hence this bill would be again proposed, with the further warning that they were going to put it across.

The labor unions are very actively engaged in trying to have this proposed bill made a law, and the president of the Kansas Automobile Trade Association was given to understand that a real fight would be made two years hence, at the next session of the legislature.

Gillette Rubber Sales $1,810,000

EAU CLAIRE, WIS., March 22—The Gillette Rubber Co. expects to reach a daily production of 1000 tires and 2000 inner tubes within a short time, according to the annual report of President S. P. Woodard, New York, at the annual meeting.

Sales in 1918 amounted to $1,810,000, compared with $455,000 for the eight months of actual production in 1917, the first year the new plant was operated. January sales this year were $197,557, compared with $72,520 in 1918; February, $260,000, compared with $108,421 in the same month last year. The production of 1918 was 91,000 pneumatic casings and 77,500 inner tubes.

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Western Carburator Reorganizes

ALMA, MICH., March 21—The Western Carburator Co. is being reorganized and will resume operations soon. The capital stock of the company, which is $120,000, will not be increased for the present. Henry Prescott is superintendent and sales manager for the company.

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Emerson-Brantingham Expands

ROCKFORD, ILL., March 20—In 1918 the Emerson-Brantingham Implement Co. bought from the International Harvester Co. the Osborne line of harvesting machinery, consisting of grain and corn binders, reapers, mowers and hay rakes. The manufacture will continue at Auburn, N. Y., until some time this summer, when it will be moved to this city. The company has opened an office at 66 Broadway, New York, for export trade.

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Prudden Wheel on 100 Per Cent Peace Basis

LANSING, March 22—The Prudden Wheel Co. is back to 100 per cent peace production, having been operating at the time the armistice was signed on 100 per cent war work basis. The company's production is back to normal, requiring the services of 1110 employees. About $60,000 worth of special machinery used in the manufacture of government war products has been returned to the Ordnance Department. The company has $750,000 invested in canceled war contracts, but a settlement with the government has practically been reached.

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Canadian Studebaker Plans 50 Daily

WINDSOR, ONT., March 21—The Canadian plant of the Studebaker Corp. is now turning out 15 machines daily, but this production will shortly be run up to the 50 mark. This plant assembles the car only from parts received from Detroit and Canadian parts makers. About 50 per cent of the material is manufactured by Canadian concerns.

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Canadian Ford Making 100 Cars Daily

WINDSOR, ONT., March 21—The Ford Motor Car Co. of Canada, Ltd., is now producing 100 cars daily and anticipates greatly increasing her output within the next month.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

$5,000,000 Auto Sales Co. Organized

DETROIT, March 22—The Federal Motor Finance Corp. has been incorporated here with $5,000,000 capital to finance dealers in the sale of cars, trucks and tractors. The organization will be national in scope, but will have its home offices here. Branches will be established in all parts of the country. Its directorates, the personnel of which will be made public in a few days, include bankers and automobile men.

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Michigan Stamping Co. Earns $501,062

DETROIT, March 22—Net earnings of the Michigan Stamping Co. for 1918 were $501,062, of which $331,062 was credited to profit and loss, and $170,000 paid out in dividends. Sales for the year totaled $3,767,784.54. Assets are placed at $2,517,907.83.

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New Tractor Works for Allis-Chalmers

MILWAUKEE, March 24—The new tractor works which the Allis-Chalmers Mfg. Co. is erecting and equipping in connection with its main works at West Allis, a suburb of Milwaukee, will be three stories, 110 x 325. It is expected to be ready in about thirty days, when the tractor department will be moved there from its Reliance works on Clinton Street. The output will be more than trebled. The Allis-Chalmers tractor is now being produced in three types.

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Commerce Building

DETROIT, March 24—Plans have been approved for the new addition to the plant of the Commerce Motor Car Co. With this building the company will have 100,000 sq. ft. of floor space. The addition will be of brick and steel and will have 285 ft. frontage on Mackie Street.

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New Cleveland in Production July 1

CLEVELAND, March 21—The new plant of the Cleveland Automobile Co., recently organized by Chandler Motor Car Co. officials to produce a $1,300 motor car, will cover approximately 200,000 sq. ft. of floor space, and will cost $650,000. The plant will be completed and the company in operation by July 1. The site of the new factory has not been definitely decided upon.

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Acason Making 80 Trucks Weekly

DETROIT, March 22—The Acason Truck Co., since completing war contract work a few weeks ago, has tripled production and is now turning out 80 trucks of all models a week. From now on this company hopes to increase production until full capacity is maintained.

First Annual Report of Oak Tire & Rubber

TORONTO, ONT., March 21—The annual statement of the Oak Tire & Rubber Co., Ltd., for its first year of operation, 1918, revealed net profits of $32,735. At the close of the year its total assets were $462,178. Out of the net profits $14,500 has been set aside as reserve.

The following directors were appointed at the annual meeting: Frank Law, Toronto; T. E. Finlay, Norwood; J. H. L. Patterson, Toronto; A. E. Willar, Galt, and William Seward, Baltimore, Md.

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Oneida Truck Co. Increases Capital and Changes Personnel

GREEN BAY, March 24—The Oneida Motor Truck Co. has increased its capital stock from $300,000 to $600,000 as the forerunner of a general expansion plan which will probably make necessary the erection of additions to the plant built about two and a half years ago. At the annual meeting Lafayette Markle, for several years president and general manager of the Republic Motor Truck Co., Alma, was elected president and general manager of the Oneida company.

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Dividends Declared

The McGraw Tire & Rubber Co., East Palestine, O., quarterly dividend, 3 per cent on common stock, paid March 1.

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Flower Valve Mfg. Co. to Add

DETROIT, March 22—The Flower Valve Mfg. Co., formerly the Flower-Stephens Mfg. Co., has completed the sale of $450,000 7-per cent first mortgage serial bonds to local bankers. The company's plant covers 6½ acres, employing over 400 men, and with its additions the number of employees will be largely increased. This company made propeller wheels and ship sets for the Emergency Fleet during the war in addition to its regular business.

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Nash Production Reaches 100 Car Mark

KENOSHA, WIS., March 22—The Nash Motors Corp. has completed its contract which called for 1600 Quad trucks for the Government and is otherwise winding up its war work. The company is now devoting 90 per cent of its attention to the manufacture of its regular car production. In February this company produced 65 cars daily. In March production will be increased to 90 cars, while the 100 machine mark will be reached early in April.

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Automatic Products for 500,000 Cars

DETROIT, March 24—The Automatic Products Co. will this year devote its entire capacity to the automobile industry, and has completed a production schedule which calls for the manufacture of its parts for 500,000 cars. During 1918 over 65,000,000 pieces were produced, a large percentage of which were used in the assembly of airplanes.

Detroit Truck Makers Use Pneumatics

Discernible Tendency Toward Use of Cord Tires for 1½- and 2-Ton Vehicles

DETROIT, March 21—The pneumatic cord tire is being adopted by Detroit truck makers as standard equipment on 1½- and 2-ton trucks. For some time the pneumatic tire has been standardized on lighter models, but a tendency is now prevalent to increase the use of pneumatics in the heavier truck field. While no truck makers have gone so far as to equip 2-, 2½- and 3-ton machines with pneumatic tires as standard, they are turning out a large number of such jobs, pneumatics having been requested by purchasers. Every local truck company is feeling an increasing demand for pneumatic tires instead of the solid variety.

Sales engineers declare the day of the pneumatic tire is coming and that the next year will see it standardized on all jobs up to 2½ and 3 tons by the majority of the big manufacturers.

Practically every tire company in the country has been working on pneumatic cord tires. The last 60 days have brought the sales engineers of all of the big Akron plants to Detroit. The companies have launched extensive advertising campaigns urging the more extended use of the cord product, and it is now apparent that their sales and publicity enterprises are beginning to bear fruit. They are overcoming the one big objection to cord tires—the greatly increased initial tire cost.

This objection has been raised by both the truck maker and the owner, but it is being beaten down at both ends by the sheer mass of statistics compiled in favor of pneumatics. The tiremakers are successfully pointing out many advantages, chief of which is a longer life of both tires and trucks obtained by the use of pneumatics.

All new 1½-ton trucks of the Commerce Motor Car Co. have 36 x 6 pneumatic cord tires as standard equipment. The Acason Motor Truck Co. is about to bring out a new 1½-ton model similarly equipped. Packard, Wilson, Federal, Republic and others are seriously considering the pneumatic tire and are placing it on their lighter machines when desired by purchasers. It is not unusual here in Detroit to see a factory experimental truck with four pneumatic tires, all of different make, and the company whose new cord product best withstands these road tests is the one going to get the tire business of the manufacturer.

The Commerce Motor Car Co. is pushing pneumatic equipment. Both Commerce, Acason and other engineering authorities declare they cut vibration and relieve road-strain to such an extent that the load capacity can be increased 50 per cent. This company is advancing this as an unusual selling feature. Its engineers advocate overloading if the tire equipment is pneumatic. This company has numerous 1½-ton machines which are carrying 2 tons.

From the manufacturing standpoint, the builders find that machines equipped with pneumatic tires may be built of much lighter units inasmuch as the jar and strain, which the solid tire truck must be built to withstand, is largely eliminated.

In 1911 the Commerce people and a number of other companies produced pneumatic tire jobs. The Commerce product was a ¾-ton machine weighing 2000 lb. At that time pneumatic tires were an uncertain proposition, and they soon gave way to the hard-rubber type. In order to use the hard rubber tires, however, this company found it necessary to practically rebuild the truck on much stronger lines. Every important unit, springs, axles, etc., had to be built much sturdier. When this job, with hard rubber tires, was ready for the road, it weighed 2950 lb.

The government was the first to realize the value of the cord pneumatic tire on the larger size trucks, and specified that its 1½-ton war truck be equipped with 36 x 6 pneumatics. While use of these tires increased the truck cost, the government found that by using them the trucks could get more capacity, withstand greater hardship, save on oil and gasoline and had many other advantages which offset the extra tire expense.

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Accessories Branch of National Hardware Assn. Meets

DETROIT, March 21—The annual meeting of the Automobile Accessories Branch of the National Hardware Association, which closed Friday night, was more of a convention of accessory manufacturers than it was of accessory jobbers. Over three hundred members were present when the gathering convened at Hotel Statler, and of this number the great majority represented factory organizations.

In connection with the convention proper, the first annual accessory show was held. This show will be a regular feature hereafter, although the question has arisen as to the advisability of staging it in connection with the annual meeting. The chief objection of holding the two events at the same time lies in the fact that the show had a tendency to keep the interest of the members from centering entirely upon the convention.

The two days of the meeting were crammed full of addresses and discussions.

The manufacturers centered their effort in convincing the hardware men that the hardware store was the logical place to handle accessories, just as logical as the garage or automobile shop, and they went the limit in urging the dealers to not only hanlle accessories, but to push their sale to a greater degree than they have been doing.

On the price question the convention took a definite stand against the "price cutter," and as a result the man who "undersells" the market is going to find it harder going in the future than in the past.

$14,000,000 In Orders Uncompleted

Few War Contracts for Tanks, Tractors and Trailers Now Being Finished

WASHINGTON, March 22—War orders for $14,929,502 worth of tanks, tractors and trailers still remain to be completed for the army. This includes:

392 6-ton tanks at $4,508,000, needed to give a working stock.

628 10-ton tractors at $4,082,000, not needed, but can be used.

450 2½-ton tractors at $1,561,950, needed to motorize 75 mm. guns.

216 20-ton tractors at $1,521,720, needed.

100 30-ton tanks at $500,000, needed as a working stock.

262 5-ton tractors at $1,181,620, needed to motorize reserve artillery.

108 3 in. gun auto-trailers at $575,000, needed for guns already completed.

In some few instances orders are being completed because there is no termination clause in the contracts, but in most cases, as will be seen above, there is still a need for some numbers of tractors, trailers and tanks.

All 5-ton and 10-ton tractors now in France are reported in use and spare parts and tops are being shipped overseas in quantities. Experimental work is being done with the 2½-ton tractor to make it suitable for motorizing the 75 mm. gun regiments.

Following is the total number of tractors that have been delivered or will be delivered on contracts:

Tractors:

2½-ton	1,000
5-ton	4,000
10-ton	2,800
15-ton	267
20-ton	400

Tanks:

3-ton	15
6-ton	950
30-ton	100

Status of Contracts Outstanding Nov. 11.

Tractors	Canceled or ordered suspended	Delivered Nov. 11 Feb. 27	Remaining Feb. 27
30-ton (tank)	2,850	0	100
2½-ton	5,079	45	450
6-ton (tank)	3 490	436	392
5-ton	7,150	2,269	262
20-ton	765	59	216
10-ton	3,823	793	628

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Pennsylvania Plans Huge Road Outlay

HARRISBURG, March 24—Plans are now completed, and some of the contracts have already been let, for the greatest program of road building and maintenance in the history of the State. Within the next 4 years a total of $130,000,000 will be spent for road work, and for the balance of this year alone more money will be spent than was spent in the last eight years. A bond issue of $60,000,000 has been passed by the legislature, $6,000,000 is available from state aid and $12,600,000 from other sources.

During the present year it is planned to build 3500 miles of primary road system, paid for by the State. All primary roads are to be constructed along perma-

nent lines, and will be built with concrete foundations. All new roads are to be built by the contract system, and some 234 companies have been bidding. After the roads are completed they will be taken over by the state and the state highways department will keep them in order. For this purpose 23 tractors, which were used last year to help farmers open up new grounds, have been transferred from the Department of Agriculture to the Department of Highways, and these will be used to drag the existing roads and keep them in shape.

There are approximately 90,000 miles of roads in Pennsylvania. The state is bearing the entire cost of extending the primary system. The counties are expected to raise the money to build and maintain the secondary routes or feeders.

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Millions for Central West Roads

WASHINGTON, March 22—Additional details of highway construction received here indicate that the entire nation is awake to highway value.

Colorado has 51 miles of highways under construction at a cost of $300,000; 91 miles ready for contract to cost $360,000; and 30 miles and 3 bridges contemplated, to cost $350,000. Maintenance on 4000 miles will amount to about $500,000, while local road and bridge expenditure will amount to about $2,200,000.

Idaho has 87 miles, costing $720,000, under contract; 45 bridges, costing $425,000, ready for contract; and about $1,800,000 worth of additional work is contemplated during the season.

Iowa will expend $15,000,000 on the road system of the state, of which about $11,000,000 will be for road and bridge construction.

Missouri has 666 miles under contract, costing $1,785,100; 888 miles, costing $3,104,000 ready for contract; and about $3,000,000 additional construction is contemplated. Local road and bridge expenditures in the state will amount to about $7,000,000.

Nebraska has 173 miles, costing $431,000, under contract; 145 miles, costing $550,000, ready for contract; and about 610 miles, estimated at $1,310,000, contemplated. Local road and bridge expenditures will amount to about $3,000,000.

Nevada has 4 miles, costing $54,666, under contract; 102 miles, costing $657,412, ready for contract; 123 miles, costing $523,000, contemplated. Local expenditures on maintenance will amount to $600,000.

Oklahoma has 178 miles, including 80 bridges, costing $1,360,000, under contract. Additional construction of 165 miles, costing $2,500,000, is contemplated. Local road and bridge work will amount to about $2,200,000.

These amounts will be supplemented by increased Federal Aid appropriations and later, it is hoped, by national construction of main trunk lines under the supervision of a Federal Highway Commission, as provided in the Townsend bill, which will come up for consideration by the next congress.

Expect British Trade to Be Free

Detroit Makers Still Await Official Confirmation of Lifting of Import Embargo

DETROIT, March 21—Counteracting the stimulus given Canadian manufacture of Detroit automobiles by the reported lifting of the British embargo on Canadian made automotive products is a prevailing belief here that Great Britain will very shortly lift her embargo against United States products, thus opening the British empire to American automotive export trade. Not a word of information regarding Great Britain's action concerning the Canadian embargo has reached this city from either Washington or London, and customs officials at Windsor, Ont., have received no official word of such a ruling.

J. A. Smith, Collector of Customs at Windsor, has taken the matter up with Canadian officials at Ottawa, however, in behalf of a number of American car makers as well as Canadian parts concerns located in the border cities.

He declares regulations are changed so frequently that it is difficult to give out definite information. He is of the belief, however, that Britain is not making any distinction whether a car is manufactured or merely assembled complete in the Dominion and thinks that an assembled car, even if assembled from American-made parts, is a Canadian product. There is a 33 1/3 per cent duty on goods manufactured in the United States.

There is no question but what American manufacturers are going after British Empire trade through the expansion of Canadian manufacturing plants, but expansion plans are being held up on the belief that the embargo against the United States will soon be lifted.

The demand of the British trade for cars, a demand already greater than Britain can possibly supply, is going to be the big factor in expected action which will permit American cars to go to England duty free, the manufacturers here declare. They point to the fact that British plants have been on a war work basis for 4 years and it will be some time before they can resume their commercial work again. The British people are buying low priced machines and that country cannot possibly produce enough such cars this year to meet requirements without import aid from the United States.

About the only information relative to Britain's embargo action comes from Ottawa, where the War Trade Commission has received two cables from the Canadian Mission in London. The first reads:

"Effect has now been given to Government decision to allow importation of Empire goods by issue of open license allowing import of all goods from British Empire, except gold and articles containing gold, unless consigned to Bank of England, spirits other than brandy or rum."

The second is:

"British Board of Trade regulations will insist only goods of Empire origin free from import restriction. Making definite announcement and asking government to provide necessary machinery to prevent foreign manufactured goods reaching England through Canada."

In the first it appears that it will only be necessary for the British agents of Canadian automobile manufacturers to apply for the necessary open license. Obviously, the policy as outlined in these cables, if adhered to or even if modified simply to an Imperial preferential tariff, will result in practically all the large American automotive manufacturers establishing plants in Canada, as it is clearly indicated that they must at least do this if they desire to compete on even terms with the automotive manufacturers who now have plants in the Dominion.

However, the tariff situation generally in so far as Canada is concerned is far from stable. The farmers, especially the western grain growers, are demanding a radical downward revision of the existing tariff. The present political split in eastern Canada practically gives the west the balance of power and consequently the demand of the western grain growers carry considerable weight. On the other hand, almost without exception, the western members of the government, while advocating downward revision of the tariff, are unanimous in declaring allegiance to the Union government.

The chief demands of the western grain growers are:

An immediate and substantial all-round reduction of the Custom's tariff.

Complete free trade between Great Britain and Canada in five years.

The acceptance of the reciprocity treaty with the United States which was rejected by Canada in 1911.

That any further reduction of the tariff of the United States towards Canada be met by a similar reduction of the Canadian tariff towards the United States. (That is free trade with the United States at any time the United States is ready for it).

Obviously, this program is heading directly for free trade between Canada and other countries and the manufacturers are vigorously opposing it in Parliament on the platform and in the newspapers. They contend that free trade or any approximation to it for Canada would immediately result in making the Dominion a dumping ground for the world, thus sounding the death knell of Canadian industry, with the consequent unemployment and depression.

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No Discussion at Buffalo S. A. E. Meeting

BUFFALO, N. Y., March 21—The future use of airplanes was the subject of a meeting of the Buffalo Section of the Society of Automotive Engineers held here last evening. The speaker was Douglas Wardrop, who spent practically all of last summer near the western front.

That a regular airplane transatlantic schedule would be in operation before the end of this year was predicted by the speaker, who bases his conclusions on the proposed flights of the United States Navy, the British flying boat en route to Nova Scotia and a large Caproni developed for the same purpose.

No discussion developed at the meeting, although in view of the attendance of C. M. Manly, president of the S.A.E., and one of America's foremost airplane pioneers; David Fergusson, chief engineer of Pierce-Arrow; E. T. Larkin, chief engineer of the Sterling Engine Co., and other prominent engineers, it was confidently expected that some interesting discussion would develop along engineering lines. Mr. Manly occupied the chair and adjourned the meeting immediately after Mr. Wardrop had finished his lecture.

The meeting was held under the auspices of the Buffalo engineering Society, which is a joint organization of the local sections of the large national engineering societies. About 100 were in attendance.

Automobile Engine Exports for Six Years

	1913	1914	1915	1916	1917	1918	Totals by Countries
Austria-Hungary		5 $748					5 $748
Bulgaria		1 $106					1 $106
Denmark					5 $870	1 $92	6 $962
Finland			2 $689				2 $689
France		25 $3,379	27 $7,688	485 $92,169	1,395 $400,408	1,499 $211,068	3,431 $714,712
Germany		10 $1,767					10 $1,707
Greece			1 $462	1 $500			2 $962
Italy	27 $5,664	47 $7,618		1 $550	103 $25,270	10 $1,200	188 $40,302
Netherlands				5 $1,500	2 $697		7 $2,197
Norway	4 $929	1 $235		6 $1,413	21 $6,177		32 $8,754
Portugal			1 $400	1 $227			2 $627
Roumania	10 $1,945						10 $1,945
Russia in Europe	12 $2,689	7 $790	3 $329	641 $137,108	220 $50,000	162 $17,287	1,045 $208,203
Spain						10 $695	10 $695
Sweden	4 $712			3 $1,699	2 $725		9 $3,136
England	2,425 $959,819	3,345 $1,296,368	8,812 $1,313,076	11,019 $1,283,995	4,858 $508,174	3,714 $411,365	34,173 $5,772,797
Scotland			1 $500			1 $305	2 $805
Ireland				1 $79			1 $79
British Honduras				1 $225	1 $169	24 $2,741	26 $3,135
Canada	8,906 $753,702	353 $71,070	465 $70,597	8,426 $1,094,354	16,668 $1,805,698	175 $927	34,993 $3,796,348
Costa Rica						1 $750	1 $750
Honduras			1 $310	2 $455			3 $765
Nicaragua				1 $99		1 $180	2 $279
Panama				1 $50			1 $50
Salvador						1 $23	1 $23
Mexico	1 $260	3 $300	1 $149	4 $1,478	8 $2,198	19 $2,907	36 $7,292
Newfoundland and Labrador			1 $104	1 $77	3 $319	21 $1,531	26 $2,031
Jamaica	1 $500		2 $146				3 $646
Trinidad and Tobago		1 $202	1 $221			1 $168	3 $591
Other British W. I.					1 $120		1 $120
Cuba	5 $718	2 $265	3 $705	24 $5,047	2 $439	13 $3,926	49 $11,100
Dominican Republic				2 $833	1 $400	6 $459	9 $1,692
Argentina			2 $708		2 $153	6,075 $714,857	6,079 $715,718
Brazil			2 $240	1 $393			3 $633
Chile		2 $970			1 $325	19 $2,408	22 $3,703
Colombia		1 $170	1 $155	1 $458		1 $61	4 $844
Ecuador			1 $692	9 $2,291	1 $300		11 $3,283
Guiana—British				6 $894		40 $4,660	46 $5,554
Peru				3 $620	1 $112	1 $186	5 $918
Venezuela	1 $250		5 $289	1 $125	1 $172		8 $816
British India	2 $175	4 $1,756		2 $267	4 $551	2 $318	14 $3,067
China						1 $364	1 $364
Dutch East Indies					3 $623	1 $180	4 $803
Japan			6 $345		1 $490	7 $1,213	14 $2,048
Siam		1 $675					1 $675
Straits Settlements	1 $197						1 $197
Australia	2 $756	24 $3,243	30 $2,499	16 $3,021	31 $3,774	51 $6,998	154 $20,291
New Zealand		3 $615	9 $1,456	4 $515	10 $1,663	2 $300	28 $4,549
French Oceania					1 $150		1 $150
Philippine Islands	1 $300	5 $1,125			6 $1,934	2 $341	14 $3,700
British South Africa		2 $301	3 $465	3 $550	21 $4,726	20 $1,708	49 $7,750
Egypt		1 $250			1 $1,134		2 $1,384
French Africa				1 $462	1 $150		2 $612
Morocco			1 $109				1 $109
Totals	11,402 $1,728,596	3,843 $1,391,893	9,381 $1,402,334	20,672 $2,631,414	23,375 $2,817,921	35,831 $4,127,257	104,404 $14,099,415

Foreign Exchange and Trade Restrictions Modified

WASHINGTON, March 22—Restrictions placed on foreign trade affecting foreign exchange transactions and financial and commercial cables have been modified by the Federal Reserve Board. Dealers in foreign exchange can now transfer funds to persons who are not enemies or allies to enemies in Roumania, Serbia, Syria, Mesopotamia, Finland, Bulgaria, Turkey in Asia and in Europe and all the Black Sea ports.

Foreign exchange dealers in the future need not secure approval for issuing travelers' letters of credit in excess of $5000. Great Britain, Canada and France are acting coincidentally with the United States in the measures outlined. Until further notice the exportation or importation of Russian rubles for the transfer of funds for their purchase by persons or dealers in the United States is prohibited.

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Spain Supervises Gasoline

WASHINGTON, March 24—The restrictions on the sale of gasoline and the substitutes, known as A. N. C. No. 2 and A. N. No. 1, manufactured by petroleum refiners in Spain, have been removed by a royal decree published Dec. 14, 1918, special permits being no longer required.

Gasoline and the substitutes mentioned will be sold at prices fixed or to be fixed by the Ministry of Supplies, which will dictate measures for the distribution of gasoline, the monthly quantities which may be put on sale by the refiners, and will exercise all necessary vigilance in regard to consumption, inspection and supplies to the different provinces.

A royal order published on the same date provides that petroleum refiners must submit to the Ministry of Supplies on the 1st and 15th of each month a statistical statement covering crude petroleum, gasoline and derivatives manufactured; that the refineries arrange their depots in all the provinces; that all merchants registered under the industrial tax may sell gasoline and the substitutes A. N. C. No. 2 and A. N. No. 1; that the sale of these substitutes is authorized by the refiners of petroleum, giving preference to public utilities, and that the maximum selling price at the factory be fixed.

The refiners are authorized to put on sale any quantities of A. N. C. No. 2 and A. N. No. 1 up to 1,000,000 liters.

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Tin Importers Association Protests

NEW YORK, March 24—The Tin Importers Assn. has enlisted the cooperation of the National Association of Purchasing Agents to remove the restrictions on the sale and price of tin. The latter association has a membership of 1800 industrial purchasing agents, a large percentage of whom are direct buyers of tin. The basis of the complaint of the tin importers is that pig tin can be purchased abroad at 25 cents per pound cheaper than here.

Calendar

ENGINEERING

April 2—Minneapolis Section, S. A. E. — Hotel Radisson. "Implements Designed for Tractor Belt Power and Their Characteristics."

SHOWS

March 22-29—Pittsburgh Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.

March 24-29—Greenfield, Mass. Greenfield Automobile Dealers' Assn., State Armory. James J. Callahan (Pittsfield) Manager.

March 24-29—Utica, N. Y. Utica Motor Dealers' Assn.

March 25-29—Wilmington, Del. Fourth Annual, Wilmington Rink.

March 26-27 — Clinton, Ia. Fourth Annual Clinton County Automobile Dealers' Assn.

March 26-29—Watertown, N. Y. Tenth Annual, State Armory, Automobile Dealers, Inc. Arthur E. Sherwood, Manager.

March 27-29—Holdredge, Neb. Third Annual, Holdredge Automobile Dealers' Assn.

March 28-30—Peru, Ill. Illinois Valley Auto Show.

Last of March — Harlan, Ia. Southwestern Iowa Motor Exhibit.

March 29-April 5 — Passenger Cars. April 8-12—Trucks, Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkman, Manager.

March 31-April 5—Cumberland, Md., Automobile Dealers Assn., Armory.

March 31-Apr. 5—New Orleans, La. Henry B. Marks, Manager.

April 1-5—Denver, Col.—Denver Automobile Trades Assn. Stadium.

April 3 — Macon, Ga. Motor Truck Demonstration, Macon Automobile Chamber of Commerce.

April 5-12 — Bridgeton, N. J. Fourth Annual, Automobile Dealers' Assn.

April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

April 8-12—Deadwood, S. D. Seventh Annual, Cars and Tractors, Deadwood Business Club.

April 16-19 — Waynesburg, Pa. Automobile Dealers' Assn. of Greene Co., Armory. Frank L. Hoover, Mgr.

April—Little Rock, Ark. Second Annual, Little Rock Automobile Dealers' Assn., Liberty Hall.

May 10-17—Bristol, Va.-Tenn. Cars, Trucks, Tractors, Airplanes and accessories. Bristol Chamber of Commerce. C. W. Roberts, Manager.

June 2-6—Hot Springs, Va. Convention, Automotive Equipment Assn., Homestead Hotel.

*Oct. 15—Paris. Grand Palais, International Automobile Mfrs. Congress.

November—London — Olympia—International Automobile Mfrs. Congress.

TRACTOR SHOWS

April 15—Walla Walla, Wash. Sectional Tractor Demonstrations.

May 5—Sacramento, Cal. Sectional Tractor Demonstrations, Demonstration Field.

June — Denver, Col. Sectional Tractor Demonstrations.

July—Wichita, Kan., Automotive Committee of National Implement Assn.

Aug.—Aberdeen, S. D. Sectional Tractor Demonstrations.

RACES

†May 17—Uniontown, Pa., probably 112½ miles.
†May 31—Indianapolis, Indianapolis Motor Speedway Assn., 500 miles.
*July 5—Cincinnati, O., Speedway.
*July 19—Uniontown, Pa. Speedway race.
*July 26—Sheepshead Bay, L. I. Speedway race.
*Aug. 22-23—Elgin, Ill. Speedway.
*Aug. 23—Sheepshead Bay, L. I. Speedway race.
*Sept. 1—Uniontown, Pa. Speedway race.
*Sept. 20—Sheepshead Bay, L. I. Speedway race.
*Oct. 1—Cincinnati, O. Speedway race.

†Sanctioned.
*Tentative dates.

CONVENTIONS

April 10-12—Philadelphia. National Assn. of Motor Truck Sales Mgrs., Bellevue-Stratford.
April 24-26—Chicago — National Foreign Trade Council. Sixth National Foreign Trade Convention. Congress Hotel.
May 1-June 1 — Atlantic City, N. J.—Pan-American Aeronautic Convention and Exhibition — Aero Club of America, the Aerial League of America and the Pan-American Aeronautic Federation.

New Dart Officers

WATERLOO, IA., March 24—C. C. Wolf was elected president of the Dart Truck & Tractor Corp. at its annual meeting. Other officers elected were vice-president and general manager, W. H. Johnson, formerly chief engineer; vice-president and sales director, M. D. Herron; secretary and treasurer, E. L. Stover. H. H. Henry, the retiring president, has accepted the vice-presidency of the Maxim Munitions Corp., the Atlantic seaboard and export distributers of the Dart line.

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Wichita Motor Co. Officers Elected

WICHITA FALLS, TEX., March 24—At the annual meeting of the stockholders and directors of the Wichita Falls Motor Co., J. A. Kemp, who has been president of the company since its organization, was elected chairman of the board of directors. J. G. Culbertson, who has been secretary, treasurer and general manager, was elected president and re-elected treasurer. A. G. Savelli was re-elected vice-president in charge of export and G. S. Brenemann, secretary. Two new buildings have recently been completed.

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Youngstown Tube Re-elects Directors

YOUNGSTOWN, OHIO, March 24—All directors of the Youngstown Sheet & Tube Co. were re-elected. The annual report showed total earnings of $25,925,-118 and net products profit of $14,589,488 after charges of depreciation, adjustment of inventories and in cost of construction for war purposes. The net surplus profits after dividends was $10,-194,767. During the year the company paid $22,157,000 in wages against $16,-396,000 in 1917, while sales decreased $5,000,000 from the previous year because of reduced tonnage and government price control. The company has inaugurated a plan of co-operation of employees in the settlement of labor differences.

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American Bronze Corp. Elects New Officers

BERWYN, PA., March 24—At the annual meeting of the Board of Directors of the American Bronze Corp. the following officers were elected: President, Harry Porter; vice-president, general manager and treasurer, Mathew Dittmann; secretary and sales manager, Edward Anderson.

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Northway Motors Starts Production

NATICK, MASS., March 24—The Northway Motors Corp. has the first series of its buildings completed and the machinery installed. They are one-story structures. Foundations for other buildings have been commenced.

Work has been begun on trucks and cars. The machines will have four-cylinder engines. The company has floated a $1,000,000 stock issue to begin business.

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Denby Buys Wolverine Brass Plant

CHATHAM, ONT., March 24—The Denby Motor Truck Co. has purchased the factory of the Wolverine Brass Co.

Carlisle Cord Tires on Peace Basis

NEW YORK, March 21—At the annual meeting of the Carlisle Cord Tire Co., the following officers were elected for the year: President, J. S. Bretz; vice-president, C. A. Gilbert; treasurer, Lewis H. Homer; secretary, F. R. Serles; assistant secretary and treasurer, C. V. Tuthill.

Since the company has been relieved from war contracts its factory has been working continuously to make up on production.

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Hayton Co. Takes Over Killen-Strait Tractor Plant

APPLETON, March 22—The plant of the defunct Killen-Strait Tractor Co., recently sold at receiver's auction, has been taken over by the Hayton Pump & Blower Co., incorporated, with a capital stock of $50,000, to manufacture centrifugal pumps, blower systems, etc. T. R. Hayton is president and general manager. E. D. Rasmussen, for twenty years connected with the pumping engine department of Allis-Chalmers Mfg. Co., Milwaukee, is secretary and general superintendent.

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Miller Rubber Officers

AKRON, March 22—The new officers of the Miller Rubber & Tire Co. elected for the year, are: President, Jacob Pfeiffer; secretary and treasurer, W. F. Pfeiffer. J. M. Doran, C. T. Grant and F. B. Theiss, together with the officers, form the board of directors.